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National Field Research Center, Inc, Iowa City, Iowa

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A National Environmental/Energy Workforce Assessment

NATIONAL SUMMARY

Volume Four

South Dakota--Virgin Islands

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16. ABSTRACT

This study is one of 70 volumes assessing the workforce needs (manpower needs) for pollution control and abatement in the United States for the five-year period of 1976 through 1981. Seven fields for pollution control — air, noise, pesticides, potable water, radiation, solid waste, and wastewater — are analyzed, together with energy-related programs currently accentuated by the national effort to solve energy supply problems.

Designed as Phase I of a three-phase program, the complete assessment includes the following volumes: one each for the 50 states, the District of Columbia, Puerto Rico, and the Virgin Islands; one for each of the ten EPA regions; a one-volume National Abstract; a volume on National Legislation; a volume on Business and Industry; and a four-volume National Summary. The information was gathered through extensive personal interviews with responsible federal, state, and local officials in every state; with officials of representative private industrial and commercial firms; and with representatives of national industrial and trade organizations.

Phase II will develop a broad national inventory of the entire range of post-secondary and higher education training offered in the pollution control and energy areas cited above, and Phase III will offer demonstrations for curriculum changes or modifications which appear necessary to assure an adequate and properly trained national environmental/energy workforce.

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The names of the federal, state and local agencies, groups and individuals who made this study possible through their patience and cooperation would be too numerous to mention. However, it must be pointed out that the information in these summaries and the other volumes of this study is a direct consequence of their participation. The research staff served largely as reporters and documenters of the facts and opinions they provided. In some instances, the authors supplied editorial commentary, but it was with the knowledge and understanding of the particular data source. Essentially, the study is theirs, from the landfill operator or the pesticide applicator to the state, regional or the federal administrator. Its relative degree of success will be a direct corollary of the credibility decision makers attach to the information furnished by those professionals working in the fields considered by this study.

National Field Research Center
Iowa City, Iowa
Dr. Richard L. Benesh, Jr.
Project Director

PREFACE

In reviewing these summaries, it should be pointed out that differences in the consistency of information is a reflection of several factors. To begin, for a number of states, figures were either not available at the time the field research was carried out or respondents were reluctant to provide estimates because of the tenuous nature of state and local program output reporting. In a majority of instances, these circumstances were a consequence of budgetary constraints imposed by state legislatures. Thus, state and local environmental control officials have been confronted with a situation where they must depend, in large measure, on federal funding programs to maintain minimal operational status, which is not always in compliance with federal mandates. Still, some states have been especially active in mounting environmental programs consonant with federal standards and uniquely suited to their particular problems. In these cases information is relatively complete and documented to be accurate.

Moreover, the presence or absence of workforce information may be said to be a measure of the individual state approach to the importance of environmental pollution control and abatement programs; the degree of support provided by state and local government; the support for program operation and maintenance provided by the federal government; and, the immediacy of environmental pollution problems in a given state or area.

Finally, though less quantifiable, but frequently voiced, program officials in several states were less than enthusiastic about participating in the assessment because they felt that little if any positive, substantive action would come of the effort. With this in mind, it is understandable that there would be occasional reluctance to "go the extra mile" in providing professional judgments regarding specific workforce figures or projections. Still, in the great majority of instances, program officials did go the extra mile as evidenced by their frequently unsolicited post-research interest in reviewing assessment outcomes.

All of the foregoing are indicators of what might be termed an inconsistency in the level of reporting. However, it is more nearly correct to assert, given the experience of the project, that these informational disparities as well as the converse informational completeness of many states are a reasonable and accurate representation of the state of the art across the nation. This can be exemplified by singling out states, for instance, which on one hand have no mandatory certification for water treatment plant operators or no legislation governing the amounts of pollutants emitted into the air, and comparing them with those which have comprehensive legislation and commensurate funding to support that legislation. These summaries, then, while they may present reasonable estimates of the national environmental/energy workforce situation, may do more to represent the problems of individual states with respect to meeting national standards, e.g., some cannot, some will not and some may not have a need or a desire for federal assistance.

In sum, these state briefs may be distilled down to a postulate which suggests too little consistent articulation of federal policy and too little continued support for maintenance of programs which are either stop-gap in their efforts to contain pollution or have questionable long-range cost or human benefit.

FOREWORD

This report contains the state summaries of the National Environmental/Energy Workforce Assessment conducted for the United States Environmental Protection Agency by the National Field Research Center of Iowa City, Iowa. Each individual state program summary is followed by a depiction of the current and projected (1976-1981) workforce figures for the following areas:

AIR
NOISE
PESTICIDES
POTABLE WATER
RADIATION
SOLID WASTE
WASTE WATER
ENERGY

An overview of selected environmental/energy education programs has also been included. These programs do not necessarily represent the entire spectrum of available opportunities, but rather a sample of those significant, well-defined offerings which address the workforce needs of the disciplines outlined above.

More detailed information regarding the workforce assessment is to be found in the respective State or Regional volume of the study.

National Environmental Energy
Workforce Assessment

Phase I

SOUTH DAKOTA

State Summary

I. AIR

The major air quality problem in South Dakota is fugitive dust, as evidenced in the Black Hills Air Quality Maintenance Area and the Sioux Falls Air Quality Maintenance Area. The major sources are rock quarries, unpaved roads and unrestrained dust from paved roads. Other major areas of concern include monitoring for heavy metals and lead.

The primary responsibility for air pollution control and abatement in South Dakota has been delegated to the Department of Environmental Protection, Air Quality Program. The DEP Air Quality Program includes eight personnel and has estimated that there are currently approximately six additional people involved in air pollution control and abatement programs across the state.

The Department of Environmental Protection (DEP) has stated that no changes in staffing levels of the Air Quality Bureau are anticipated to occur within the next five years, although program responsibilities may increase. A one to two percent per annum increase is projected to fulfill the statewide private sector workforce requirements to 1982. Occupational availabilities will be limited during the next three to five years and career oportunities at the state level will be scarce, mostly turnover replacements, as the staffing levels seem to have reached their maximum.

II. NOISE

The State of South Dakota to date has developed no programmatic responsibility for noise pollution control and abatement at the state level. The population fo the state is 665,507, a density of 8.8 persons per square mile. Although manufacturing is increasing statewide, South Dakota remains agriculturally based and nonindustrial. The need for legislation and a state noise program have not been demonstrated successfully as yet in South Dakota.

Currently, there is no workforce at the state level. The municipal programs across the state are non-existent with the exception of two communities which have established ordinances. To date, there are no local noise pollution control and abatement perosnnel other than the law enforcement authorities.

Within the next three to five years the establishment of a state level noise program is described by state officials as unlikely. However, with the passage of legislation, personnel would be assigned to establish a program.

Career opportunities must be described as exceedingly limited. With the establishment of a state level program, competition would be keen were persons properly qualified. It appears likely that job opportunities in the noise field will be scarce at least for the ensuing few years.

III. PESTICIDES

The South Dakota Department of Agriculture, Division of Agricultural Regulations and Inspections has been designated as the lead agency for pesticides control. The Department of Agriculture is responsible for the implementation of the certification program as well as other pesticides related activities in South Dakota. The Department offers technical assistance and cooperation to the state's Indian reservations regarding training and certification of applicators and expertise regarding Integrated Pest Management (IPM) is available upon request.

Department personnel feel that the major increases in the pesticides workforce have occurred. Minimal growth is anticipated at the state level while a two percent per annum increase in commercial applicators will take place to 1980 at which time the workforce requirements will remain stable for the ensuing two to three years. There should be no increase in the private applicator category.

Career opportunities at the state level will be limited over the next three to five years. Job openings will be more numerous at the applicator level. The applicator category is usually marked by a high turnover rate. Many of these jobs are seasonal in nature and characterized by meager salary and lack of upward mobility.

IV. POTABLE WATER

In South Dakota water is an abundant natural resource. The protection of the state's supplies and availability of drinking water to the citizens are a high priority within the state. The State of South Dakota has indicated intentions to assume primary responsibility for the Safe Drinking Water Act.

The responsibility for potable water has been assigned to the Department of Environmental Protection, the Water Hygiene Program. The Water Hygiene Program is primarily concerned with drinking water and swimming pools.

The Department of Environmental Protection has estimated increases in the Water Hygiene Program to meet the workforce requirements to 1982 predicated on the state's assuming primary enforcement responsibility for the Safe Drinking Water Act. Should the state not assume "primacy", the DEP projects virtually no changes in the composition of the Water Hygiene Program staff. Statewide workforce profiles will illustrate an approximate five percent per annum increase to 1982.

Job opportunities will be available in the water related fields. The career potentials, however, will be limited as little growth has been projected for this environmental area.

Career opportunities at the degreed and professional level will also be available over the next three to five years but on an even more limited basis than the non-degreed, non-professional level.

V. RADIATION

Although few radiation control problems currently exist in South Dakota, the SDCL 34-21 mandated responsibility for the prevention of unnecessary human radiation exposure to the Department of Health. Pursuant to this, the Radiological Health Hazards program was established. This program is primarily concerned with X-ray installations in medical and dental facilities. These facilities and activities related thereto are the major program component.

The present staff allocated to the Radiological Health Hazards program consists of two full-time professionals. Across the state, Department of Health personnel have estimated that approximately 2,000 persons are occupationally involved in the medical radiation field.

South Dakota is currently (1976) not an "Agreement State." South Dakota indicated that exposure to the citizenry from the atomic energy industry, natural radioactivity or weapons testing is insignificant when compared to the exposure from medical/dental uses. The NRC currently is responsible for these other than medical uses and their ramifications in South Dakota.

Engineering and scientific related career opportunities will be available over the next five years. New careers will, most likely, not emerge in the radiation control field in South Dakota.

VI. SOLID WASTE

Among the major concerns of the State of South Dakota regarding solid waste management are: (1) dumps; (2) the allocation of monies to the local level for areawide planning; and, (3) the identification of toxic and/or hazardous wastes sites. The statewide solid waste management program is conducted by the Department of Environmental Protection (DEP). Solid Waste Management and the Air Quality programs have been combined and together compose one of the four DEP components.

The Solid Waste Management Program is expected to experience increases in staffing levels over the next three to five years. With the passage of the Resource Conservation and Recovery Act, however, increases may be greater in order to fulfill the new responsibilities. Information regarding the impact of this Act was not available at the time of this writing, however. Professionals in the field have estimated that the private sector workforce may experience a three to five percent per annum increase over the next five years.

Career opportunities, although limited, will be available from the non-degreed through the degreed levels to 1982 in South Dakota. The areas of resource recovery and hazardous and/or toxic wastes should present the largest number of job offerings.

VII. WASTE WATER

The responsibility for the environmental area of waste water in South Dakota has been allocated to the Department of Environmental Protection (DEP), the Water Quality Program. The Water Quality Program monitors and protects the lakes and waterways of the state.

Supportive of the Program and the Department is the quasi-legislative, quasi-judicial Board of Environmental Protection. This Board issues rules and regulations governing water quality standards across the state.

The statewide workforce including the DEP staff will experience increases over the next three to five years. These increases will not be in excess of five percent per annum for the most part.

Currently there are approximately 150 operators per year who are recipients of waste water treatment training. Primarily this training is accomplished during on-site visitations by the Training Officer. The Waste Water Training Officer often acts in the capacity of a trouble shooter.

Career opportunities in the waste water field will be available specifically on the certified operator level. Operators will require increasing skills training as plants are upgraded. Limited degreed level positions will represent job opportunities in South Dakota over the next five years.

VIII. ENERGY

The major resource in South Dakota is water which is a constraining factor in energy conversion. Although the future is unclear as to conversion of coal to other forms of energy in the state, several fossil fuels related projects have been proposed for South Dakota. The environmental problems associated with energy development will be manifested as a result of energy resource extraction and/or conversion in the neighboring states of North Dakota, Montana and Wyoming.

The lead agency is the Office of Energy Policy and currently the staffing level totals seven. Firm figures are not available for the private sector. Substantial increases will occur at the state level.

Career opportunities will be available for the most part in the private sector. Attorneys and Policy Analysts will present job opportunities at the state level. Research, Environmental Impact Statement and energy conservation expertise will be representative of the occupational skills desired in the next three to five years at both the state and the local levels.

Evidence suggests that South Dakota will become a "bridge" state for the transportation of coal through South Dakota to and from other states. Pipelines, railroads and other secondary factors will affect South Dakota as energy development continues within the neighboring states of North Dakota, Montana and Wyoming.

STATE OF SOUTH DAKOTA - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)
(estimated)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR[1]	14	14	15	15	16	16	2%
NOISE	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES[2]	1,368	1,395	1,423	1,451	1,480	1,510	2%
POTABLE WATER	279	291	313	327	344	359	5%
RADIATION[3]	2,235	2,235	2,237	2,237	2,238	2,238	14%
SOLID WASTE	205	215	226	237	249	261	5%
WASTEWATER	224	235	249	261	274	284	5%
ENERGY[4]	7	9	16	18	23	25	12%
TOTALS	4,325	4,394	4,479	4,546	4,624	4,693	2%

[1] Includes no increase at state level.

[2] Does not include private applicators.

[3] Increases shown for state personnel only.

[4] Does not include private sector.

EDUCATION

South Dakota's institutions of higher education are just beginning to develop programs in the environmental area. Majors in such areas as engineering, earth science, agronomy, biology and chemistry are common, but there is apparently only one environmental program in the state. This program is an Environmental Management major at South Dakota State University. In 1976, the majority of the graduates were placed in environmental fields or in positions involving planning at the district level.

There are very few two-year colleges in South Dakota. Because the state has a small population and is generally rural, it does not appear that more two-year institutions will be created in the near future. Of the few two-year colleges in the state, none has an environmental program at the present time.

The environmental education needs of South Dakota will probably have to be met at the four-year level for the foreseeable future.

LEGISLATION

The environmental/energy legislation for South Dakota was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Environmental Policy Act

Remedies for Protection of the Environment Law

Clean Air Act

Agricultural Pesticide Application Act

Insecticides, Fungicides and Rodenticides Act of 1947

Radiation Control Act

Radiation Exposure Control Act

Solid Waste Disposal Act

Water Pollution Control Law

National Environmental Energy Workforce Assessment

Phase I

TENNESSEE

State Summary

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I. AIR

The Tennessee Department of Public Health, Bureau of Environmental Health Services, is responsible for the implementation and enforcement of the state's Air Quality Act. Knox, Hamilton, Davidson and Shelby Counties are authorized to administer local air programs. The state agency employs 90 persons for air pollution control, consisting chiefly of engineers, scientists and technicians. The Knox program employs 11 staff members, Hamilton, 22, Davidson, 13 and Shelby, 13, with the same personnel as the state agency. Available information indicates that there are approximately 850 persons in Tennessee employed in air pollution control positions in other governmental agencies and private industry.

Growth in the state program is not expected to occur. Of the four local programs, only the Nashville program will grow, according to officials, if it acquires responsibility for enforcing motor vehicle inspection/maintenance regulations.

The career potential for all occupations within the air pollution control fields in the state is reasonably stable. However, even though workforce requirements for personnel have somewhat stabilized compared to the last five years, there will be a continuing demand for qualified personnel at all levels within the air pollution control field. In addition, it is important to note that technically oriented training programs for professionals are considered inadequate by officials although the training committee formed by Region IV EPA is assisting in meeting training needs.

II. NOISE

Tennessee has not enacted any noise legislation on a statewide basis. The State Legislature commissioned a joint committee study concerning noise pollution, and the Commissioner of Public Health was designated to supervise this study. The Division's Technical Services Branch reviews citizen complaints but, without legislative authority, is unable to take substantive action. Sources are hopeful that legislation will be adopted within the next several years. The first year's program will require three to four persons, and further expansion is anticipated.

In the Nashville-Davidson County Health Department, one person works part-time in noise althouth the county has no regulations for enforcement. In Memphis, the police department has authority to enforce nuisance and vehicle regulations, but no acoustical criteria are included in the regulations. The Chattanooga-Hamilton County Air Pollution Control Bureau recently completed a noise survey and takes citizen complaints concerning noise pollution problems, although it has no regulations to enforce. The Bureau plans to add a noise component to its program once regulations including acoustical criteria are enacted in the county. The staff will initially include three persons.

State sources regard the noise pollution field as a relatively new program area and will rely on the impetus and support of the Environmental Protection Agency for the development of a comprehensive program. If such a program is developed, the career potential in the field will markedly improve.

III. PESTICIDES

The Plant Industries Division of the Tennessee Department of Agriculture holds responsibility for the implementation of the state's pesticide programs. The Cooperative Extension Service provides training to pesticide applicators. The Food and Drug Division of the Department of Agriculture performs pesticide-related analyses. The Plant Industries Division employs eleven persons: two administrators, five inspectors, one chemist and three secretaries. The Food and Drug Division employs three chemists. The Extension Service utilizes ten extension specialists, and 94 county agents train private applicators. An additional 28 positions are projected to be added within the next five years for pesticide programs, most to be in the Plant Industries Division.

State sources predict that 3,287 commercial applicators will require certification by October 21, 1977, as will approximately 50,000 private applicators. The number of commercial applicators is not expected to increase appreciably during the next five years. Skill levels will increase to a small degree, and demands will increase for degreed professionals with expertise in the field to serve as consultants.

No major changes are anticipated to occur in the operator training program. Agricultural curricula at the graduate and undergraduate level are chiefly carried out by the University of Tennessee.

IV. POTABLE WATER

The Tennessee Department of Public Health is responsible for the state's water supply regulatory program. State sources predict that Tennessee will accept primacy for the Federal Safe Drinking Water Act during 1977. While approximately 13 persons in the Department currently service the water supply program, significant staffing increases will be required to implement the Act. If sufficient funding is received, an estimated 40 persons will comprise the staff by 1982.

Operators in charge of water treatment systems must be certified. There are 1,143 certificates issued to operators, although the number of operators is approximately 800. Sources estimate that there are 50 laboratory workers, 50 maintenance workers, and 350-400 uncertified operators in the state. Increased requirements for all these personnel are projected for the next five years.

The Department offers an Operator Training School that offers upgrade and short courses to plant personnel. Officials propose to develop a comprehensive vocational program to meet the needs of all levels of plant and system personnel. In order to do so, significant increases in instructional personnel will be required however, state budget limitations could prevent the development of such a program.

Career opportunities should occur in the state agency for engineers and scientists. Demands for entry level and other operators should also increase.

V. RADIATION

The Tennessee Department of Public Health carries out the state's radiological health program as authorized by the Tennessee Radiological Health Service Act. The Department registers, licenses, inspects and monitors sources of radiation. The state currently contains several nuclear facilities.

The Department's Radiological Health Section employs eleven persons: ten radiological physicists and one chemist. According to officials, this staffing level should increase within several years to include six additional radiological physicists, one technologist and one secretary. The Oak Ridge National Laboratory employs five health physicists for radiation control functions. The Tennessee Valley Authority is constructing two reactors in the state and data indicate that within five years one health physicist and nine technicians will be employed at both of the plants for radiation control.

No new careers appear to be emerging within the radiation field in the state. State sources suggest that training available to staff is adequate and is continually improving through the efforts of the regional training committee formed by the Region IV Environmental Protection Agency. There is currently no certification program for health physicists in the state.

VI. SOLID WASTE

The Tennessee Department of Public Health implements the state's Solid Waste Disposal Act. Officials expect that during 1977 state hazardous waste legislation will be enacted that will comply with the Federal Resource Conservation and Recovery Act. The program is currently staffed with 20 persons: four engineers, one attorney, nine environmental consultants, two geologists, one technician and three clerical employees. To implement the hazardous materials program, preliminary estimates provide for the addition of at least nineteen personnel consisting of engineers, geologists and other scientists.

Sources estimate that there are approximately 214 persons in the state working in sanitary landfills, chiefly heavy equipment operators and weighmasters. There is one hazardous waste processing center in the state, which has three employees. Projections for the solid waste and hazardous materials operators are not yet available. The state agency does not plan to promote recovery systems because of costs and potential market problems.

Certification is not presently required for landfill operators in the State of Tennessee. The Department does conduct a training program for operators twice a year. The Department evaluates landfills on-site, and every landfill must have at least one registered operator to be in total compliance with the law.

VII. WASTEWATER

The Tennessee Department of Public Health implements the state's water quality program and anticipates accepting NPDES permitting authority in 1977 or 1978. While approximately 159 persons presently work in wastewater, chiefly engineers and scientists, an additional eight will be required to implement the new program: one attorney, engineers and scientists. No other increases are projected to occur during the next five-year period, due to legislative constraints.

Operators in charge of wastewater treatment plants and collection systems must be certified. There are currently 1,064 certificates that have been issued to operators, although the actual number of active certified operators is approximately 700. Sources estimate that there are 50 laboratory workers, 50 maintenance personnel and 600 uncertified operators in the state. An estimated 50 persons are employed by industries for wastewater and there are 20-30 consulting firms that service the field. The Tennessee Valley Authority also employs a significant number of persons for wastewater. The number of operators, laboratory personnel and maintenance workers is expected to increase about 8% annually and the number of persons in industries is expected to double. Increases will also occur in the Tennessee Valley Authority.

The Department conducts an Operator Training School which offers package plant schools, short courses and upgrade/improvement courses.

VIII. ENERGY

The Tennessee Energy Office is the state's lead energy agency. The Office advises the Governor on the general energy situation and develops measures to minimize the state's energy problems. Under the mandates of the Federal Energy Policy and Conservation Act, the Office is conducting training seminars to assist homeowners in reducing energy costs. Sixteen persons are employed in this office, consisting of administrators, energy management advisors, energy analysts, and energy analyst trainees. Officials indicate that there will be a growing need for conservationists and lawyers, although no specific projections could be made since new positions will be totally dependent upon the availability of funds.

A Governor's Advisory Committee was recently created which assists with the development of a State Energy Conservation Plan. The Committee has worked in conjunction with the Tennessee Energy Office and the University of Tennessee Environmental Center to prepare the proposal for submission to the Federal Energy Administration.

With the limited availability of information concerning energy programs, it is impractical to offer trends for career potentials in the energy conservation and conversion field. However, considering the growing energy shortage, it is reasonable to assume that while job opportunities are declining in traditional energy programs, there will be considerable demand for personnel with experience in nuclear energy.

STATE OF TENNESSEE - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR[1]	150	150	150	150	150	150	0%
NOISE[2]						7	n/a
PESTICIDES[3]	222	236	250	250	250	250	2%
POTABLE WATER[4]	1,613	1,777	1,937	2,089	2,245	2,400	8%
RADIATION[5]	16	23	31	40	47	47	25%
SOLID WASTE[6]	20	31	35	35	39	39	12%
WASTEWATER[7]	2,100	2,300	2,500	2,700	2,900	3,000	8%
ENERGY[8]	16						n/a
TOTALS	4,137	4,517	4,903	5,264	5,631	5,893	7%

[1] Includes the state and local agencies. Not included are an estimated 850 persons in other agencies and the private sector.

[2] The 1981 figure includes preliminary staffs for the state and Chattanooga-Hamilton County programs. Development of staffs in other agencies could also occur.

[3] Includes state and county personnel and does not include an estimated 3,287 commercial and 100,000 private applicators to be certified by October 21, 1977. Little future workforce growth is expected for applicators.

[4] Includes state personnel and estimates of all employees at the State's water treatment plants.

[5] Includes state personnel, TVA and the Oak Ridge National Laboratory.

[6] Includes the state agency personnel. Does not include the estimated 217 other persons in the state involved in solid and hazardous wastes excluding collection.

[7] The above estimates include the state agency, plant personnel, the private sector and TVA.

[8] The above includes the state lead energy agency. Projections are unavailable, although increasing demands may occur for attorneys and conservationists.

EDUCATION

There are several educational institutions in Tennessee which are designed to prepare students for employment in environmental fields in private industry and government. Chattanooga State Technical Community College offers an A.S. degree in Chemical and Environmental Technology. East Tennessee University provides B.S. and M.S.E.H. programs in Environmental Health as well as a Public Health Sanitation School and Certificate.

The University of Tennessee at Knoxville offers an environmental engineering curriculum on the B.S., M.S., and Ph.D. levels. Students at the University of Tennessee at Nashville may earn a B.S. or M.S. degree in Civil Engineering. Vanderbilt University offers two bachelor degrees, the B.Engr. in Environmental and Water Resources Engineering and the B.S. in Environmental Science. The former program is also offered on the M.S. and Ph.D. levels while the latter program may be continued on an M.S. level.

Austin Peay State University offers a B.S. degree in Environmental Science. The State Technical Institute at Memphis offers a two-year Environmental Technology program. A four-year curriculum in Environmental Science and Technology is offered at Middle Tennessee State University. Walters State Community College provides an A.S. program in Environmental Health Technology. Volunteer State Community College offers A.S. degrees in three options through the Department of Conservation and Environmental Technology.

LEGISLATION

The environmental/energy legislation for Tennessee was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Tennessee Air Quality Act

Pest Control Operators Act of 1972

Insecticide, Fungicide and Rodenticide Law

Public Water Supply and Sewer System Law

Radiological Health Services Act

Solid Waste Disposal Act

Public Water and Waste Water Environmental Health Act of 1971

Water Quality Control Act of 1971

Production of Oil and Gas Law

Surface Mining Law

National Environmental Energy Workforce Assessment

Phase I

TEXAS

State Summary

I. AIR

The Clean Air Act of Texas was passed in 1965. The major purpose of the Texas Clean Air Act is to safeguard the air resources of the state from pollution by controlling or abating air pollution and emissions of contaminants. The Act also provided legislative authority for the establishment of a nine member Texas Air Control Board (TACB). The Board is composed of 365 persons. The TACB has been designated as the agency with primary responsibility for the protection of Texas air resources.

Statewide staffing estimates include five to six local agencies with approximately 150 air pollution personnel. The number of air personnel in the private sector is estimated to be 250.

Across the state, increases in air personnel are anticipated to occur at an approximate rate of three percent per annum. Career availability in the air quality field should be apparent at the degreed level and above for the next three to five years. Ever increasing technology will require added skills training and unique areas of expertise. Engineers will continue to be in demand but training will need to include the specialized air quality subject matter.

Specific occupational areas which should be available include: radiation monitor, air analyst (air tester), meteorologist, industrial health engineer, and industrial hygienist.

II. NOISE

Currently in Texas there is very little activity in the field of environmental noise control. Texas has not enacted legislation at the state level. There are, however, municipal ordinances in several cities across the state. Currently, these 17 cities have a combined total of 41 municiapl noise ordinances.

The Texas Department of Health Resources, Division of Occupational Health and Radiation Control has been designated as the state lead agency for the area of environmental noise control. The Division conducts the occupational health and safety program which has defined responsibilities in the area which includes the work place environment. No personnel are assigned on a full-time basis to environmental noise control. Approximately 50 to 75 persons are occupationally involved in noise control activities across the state.

Increased regulation and control of noise emission will require the development of particular courses and training programs to the two year level for careers which will supplement the activities of the more highly trained specialists already in the field. Such careers might be broadly termed environmental specialists or technicians. Other more specialized options such as noise technicians should also develop in the near future. There will be the continuing need for university trained scientists and researchers. Systems analysts, attorneys and graduates in business administration will continue to comprise a smaller though important segment of the field.

III. PESTICIDES

The State of Texas has designated the Texas Department of Agriculture (TDA) as the lead agency for the control of pesticides related activities and persons as well as the products themselves. Several other agencies cooperate with the Department in various activities. Included are the Texas Structural Pest Control Board, Texas Department of Health Resources, Texas Water Quality Board, Texas Animal Health Commission and Texas A & M University.

A Coordinating Council has been created by the Department of Agriculture and consists of members of all of the cooperating agencies. This council is responsible for coordinating certification activities and for allocating overlapping areas of responsibility to the appropriate agency.

Overall statewide increases in staffing levels will occur to 1982 at the rate of approximately three percent per annum. Private applicators, which number approximately 212,000 will experience a growth rate which should not exceed one percent per annum.

A number of career options which will necessitate varying technical skill competencies, as well as those which will require more extensive educational programs, will be available to 1982. There will be a need for professional level training in less specialized areas since pest control extends into the areas of water, solid waste and air.

IV. POTABLE WATER

Aquifers, which are water bearing strata of permeable rock, sand or gravel, underlie in excess of 50% of the surface area of Texas. In the past, this water represented the major source of municipal supplies. Today, however, the cities of the state are becoming increasingly dependent upon surface water. The exhaustion of the aquifer water supplies is a major concern to the state.

Texas has approximately 4,466 drinking water supplies, 90% of which are municipal systems. The predominant problems associated with drinking water in Texas are fluorides and nitrates.

The Texas Department of Health Resources, Bureau of Environmental Health, Division of Water Hygiene is designated as the lead agency to protect public drinking water supplies under the Texas Law and Statutes.

As the population and industrial activity increase in Texas, so too will the need for drinking water personnel increase. Texas has indicated intention of assuming primary enforcement responsibility for the Safe Drinking Water Act, P.L. 93-523. The agency to be charged with this responsibility, has not as yet been determined. However, it is most probable that the Department of Health Resources, Bureau of Environmental Health, Division of Water Hygiene will be designated as the responsible agency.

Career opportunities will be available in the field of drinking water over the next three to five years. Operating personnel will be in demand as plants are constructed and/or upgraded.

V. RADIATION

Texas was one of the first states to become an "agreement" state with the Atomic Energy Commission, or Nuclear Regulatory Commission (NRC) as it is called today. Under the terms of this agreement, the state licenses byproduct, source, and special nuclear materials. Currently, Texas has a total of 1,338 licenses across the state. The NRC maintains 118 of these, while the state has accomplished 1,220 licensing activities.

Texas conducts an extensive radiation control program. Currently, only five states across the country maintain radiological health personnel which number in excess of the Texas state and local workforce. The primary responsibility for radiation control in Texas has been allocated to the Department of Health Resources, Occupational Health & Radiation Control Division, Radiation Control Branch. It has been estimated that the statewide workforce consists of 16,050 persons in addition to 28 state level personnel. Increases have been projected to approximate a five percent per annum growth rate to 1982.

Career opportunities, as a result of expansion in the radiation control field, are anticipated to be available in the medical, industrial, nuclear, and dental areas. Demand will exist for technically trained people, to work as medical and nuclear technicians.

VI. SOLID WASTE

Solid waste management has gained new dimension in Texas during the last few years. Surrounding states regard the Texas solid waste legislation as a model within the field.

Texas has identified approximately 1,200 solid waste sites across the state. An estimated 95% of these sites are public and the remaining 4% are private facilities.

Primary responsibilities for the administration of the Solid Waste Management Act have been delegated to the Texas Department of Health Resources. Surveillance of municipal sites and enforcement of standards are two major activities. This Division is also involved in engineering and geological evaluation and will become extensively involved in the new federal Resource Conservation and Recovery Act.

The total number of people working across the state at solid waste sites has been estimated at 3,153. State level personnel number approximately 59. Historically, solid waste has not been high on the list of environmental concerns in Texas. With the passing of recent state and federal legislation, however, the state anticipates increases in solid waste personnel. Workforce requirements in solid waste will experience increases due to past neglect and increasing needs.

The integration of more advanced technology, along with more stringent regulations and public demand for more efficiently operated sites indicates good career potential in the solid waste management field.

VII. WASTEWATER

Substantial improvements have taken place across Texas in the areas of water pollution. But problems do exist. Agricultural wastes constitute one of the most serious threats to the waters of Texas. The manifestations of agricultural wastes include mineralization return flows, animal and poultry wastes, pesticide and herbicide laden runoff, crop residue, and silting. A problem which is somewhat unique to Texas and which is now well under control is subsurface or underground waste disposal.

Pursuant to the Texas Disposal Well Act and the Texas Water Code, the Texas Water Quality Board has been designated as the agency with primary responsibility in the area of water pollution control and abatement. The Board with over 230 staff employees is responsible for the issuance of permits, holding of public hearings, enforcement, administration of the construction grants program, stream monitoring, and other areas related to statewide water quality management.

Statewide increases should occur within the wastewater workforce. These increases are estimated to approximate three percent per annum to 1982.

Wastewater treatment technology is becoming increasingly more sophisticated. Operators will require intensified training in order to increase skills and knowledges required to operate these plants.

VIII. ENERGY

Texas is a leading energy resource state. Texas has led the nation for the last 40 years in mineral output value and ranks first in output of petroleum (crude), natural gas, natural gas liquids, carbon black, magnesium chloride, magnesium metal, natural graphite, and value of cement and recovered sulphur output. Texas also produces substantial quantities of aluminum metal, metallic sodium, uranium, clays, lime, salt, sodium sulphate, helium and sand and gravel.

The major state agency identified for purposes of this study is the Governor's Energy Advisory Council. The Council was created by executive order in 1974. With the enactment of the Energy Policy Planning Act in 1975, the Council became a state agency.

The major purpose of the Governor's Energy Advisory Council is to formulate state energy policy. Other areas of responsibility are included within the scope of the Council. The Council includes 39 personnel and no firm figures are available at present regarding the total number of personnel statewide.

The legislature must pass on all increases in staff for the Energy Advisory Council. At the present time, the staff is considered to be adequate and no increases or decreases are anticipated.

While workforce projections for the private sector are highly tentative, sources in the field indicate that significant growth may occur in areas involving conservation expertise. Other areas of specialization will also experience growth.

STATE OF TEXAS - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)
(estimated)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR	765	786	807	829	853	877	3%
NOISE[1]	68	70	72	74	76	78	3%
PESTICIDES[2]	16,607	17,117	17,480	17,836	17,842	18,201	2%
POTABLE WATER	7,451	7,703	8,126	8,550	8,979	9,426	5%
RADIATION[3]	28	29	30	31	32	33	3%
SOLID WASTE	3,277	3,519	3,790	4,085	4,395	4,730	8%
WASTEWATER	14,397	14,397	15,130	15,881	16,828	16,834	3%
ENERGY	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTALS	42,593	43,621	45,435	47,286	49,005	50,179	5%

[1] Does not include growth for state personnel.

[2] Does not include private applicators.

[3] Does not include more than 16,000 people involved in radioactive materials usage.

EDUCATION

Approximately 10% of the public and private postsecondary educational institutions in Texas offer environmentally related courses and/or degree programs. Information was not as readily available regarding community or junior colleges in the state.

East Texas State University at Commerce offers Bachelor's and Master's degrees in Environmental Studies through the Department of Earth Sciences. Lamar University at Beaumont conducts several environmental/energy programs which offer a Bachelor of Science degree. Master's and Doctor's degrees are available in Environmental Science and Environmental Management from the University of Texas, while Sam Houston State University offers a B.S., M.A., and M.Ed. in Environmental Science.

The Stephen F. Austin University conducts a Bachelor level degree program in Environmental Science and Texas A & M University offers an environmental program which leads to a Bachelor of Science degree.

Of the 36 private senior colleges and universities in Texas, four have been identified as currently maintaining environmental/energy related programs. William Marsh Rice University offers the following degrees: B.A., B.S , M.E.S.E., M.S., and Ph.D. through the Department of Environmental Science and Engineering. The Department of Mechanical Engineering at Southern Methodist Unviersity offers post baccalaureate degrees in environmental engineering which include the M.S. and the Ph.D.

LEGISLATION

The environmental/energy legislation for Texas was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Texas Clean Air Act
Pesticide Control Act
Herbicide Law
Texas Sanitation and Health Protection Law
Radiation Control Act
County Solid Waste Control Act
Solid Waste Disposal Act
Refuse Dumping Law
Disposal Well Act
Oil and Hazardous Substances Spill Prevention and Control Act
Texas Water Quality Act

National Environmental Energy Workforce Assessment

Phase I

UTAH

State Summary

I. AIR

The State of Utah had no air pollution control laws until May, 1967. Public concern for air quality, however, dates to 1906. By 1920, Salt Lake City was the smelter capital of the world and air quality was deteriorating. Air quality has significantly improved, however, through the implementation of more stringent state and federal legislation.

Legal authority has been established for the Air Conservation Committee (ACC) to adopt standards and regulations and to establish enforcement procedures. The ACC is established within the State Division of Health which has the responsibility of administering the Air Conservation Program, through the Air Quality Bureau. The Air Quality Bureau is composed of 21 professionals, while statewide air personnel are estimated to number approximately 100. Across the state, estimates have been proposed for a 6% per annum growth over the next three to five years.

Emphasis within the Bureau is away from monitoring and data collection and toward enforcement and planning. Air quality specialists and public health engineers have the greatest career potential within the Bureau.

In the private sector, implementation of new technology to achieve compliance standards will enhance the career potential of highly trained engineers, industrial design specialists, chemists and air quality technicians.

II. NOISE

Currently in Utah there is no state noise restriction. However, with the exception of Colorado, the State of Utah has the most active noise pollution control and abatement program in the Rocky Mountain Prairie Federal Region VIII at the municipal level.

The Department of Social Services, Division of Health, Environmental Health Section has been designated as the lead agency. Current staffing levels include four personnel assigned to the Bureau of Radiological and Occupational Health and approximately 50 professionals statewide. Some of these personnel, however, are involved in other areas of responsibility; for example, law enforcement. Workforce profiles should experience an approximate 6% per annum increase over the next three to five years in Utah.

Increased regulation and control of noise emission will require development of special training programs at the technical level in order to supplement the activities of the more highly trained specialists. Such careers may be termed environmental technicians. There will be a continuing need for university trained scientists and researchers but to a limited degree in the state. Salary levels in the private sector will be higher than at the state or local level.

Noise control will remain somewhat restricted in terms of workforce for the next three to five years.

III. PESTICIDES

The Division of Plant Industry of the State Department of Agriculture, administers programs which pertain to plants and plant products. Programs included are: cooperative pest control, enforcement of plant quarantines, and supervision of the testing and licensing of private commercial pesticides applicators.

The workforce includes 26 state level personnel and 7,000 private applicators as well as 526 commercial and non-commercial applicators. Over the next three to five years, no increases or decreases are anticipated in the numbers of state personnel. Applicators in all categories should experience an approximate one percent per annum growth rate.

Career opportunities in the area of pesticides in Utah will be limited due to minimal increases in personnel which have been forecast. Degreed level personnel will be needed in research and in administrative capacities. The less than degreed career options will represent the most numerous occupational opportunities.

Training and certification of private and commercial applicators has accelerated. Utah's program has been well received within the agricultural community. Thus far, approximately 400 commercial applicators and 2,300 private applicators have been certified.

IV. POTABLE WATER

Utah is water poor, the second driest state in the nation. On the other hand, Utah is an energy rich state. Not only will energy resource development affect water quality but it is, to a large degree, contingent upon availability of water. The two critical water issues in the state are quality and quantity, therefore.

Primary responsibility for potable water has been allocated to the Utah State Division of Health, Bureau of Water Quality, Water Supply Section. Staffing levels for the Bureau include 10 water supply personnel. There are approximately 1,000 water personnel across the state. Statewide the workforce is anticipated to experience an approximate 14% per annum growth rate to 1982. This is predicated on the fact that Utah has indicated intentions of assuming primary enforcement responsibility for the Safe Drinking Water Act. However, should the state not assume "primacy", the workforce projections would be decreased by approximately 50%.

Career opportunities will be available on the operator level in all classifications. However, specific staffing increases will be a corollary of the degree to which federal funding will be available to augment those state programs necessary to meeting federal guidelines. Positions at the state level will include engineers, biologists, computer specialists, and hydrologists.

V. RADIATION

Problems related to radiation and radioactivity are not as serious in Utah as in some other states. Utah does have uranium mining and milling and tailings are a source of concern. Utah citizens are also concerned that the state's salt dunes will become sites for radioactive waste disposal.

The primary responsibility for radiation control in the state has been allocated to the Utah Department of Social Services, Division of Health, Environmental Health Section, Bureau of Radiological and Occupational Health. The workforce includes less than 100 persons statewide. A one percent per annum growth rate is projected for Utah radiation control personnel to 1982. State level personnel will experience a growth rate in excess of one percent due specifically to an expressed need for health physicists. Radiation control expansion will be kept to a minimum, however, relative to the workforce. The private sector will be responsible for the majority of the workforce increases, numerically, in Utah. The salaries will be higher and the turnover maintained at its current low level. The development of power plants in the state will affect the workforce profile in the near future.

Limited career opportunities will be available especially at the degreed level. Should Utah become an "agreement" state, job opportunities at the state level would increase somewhat. Nuclear expertise would be more in demand.

VI. SOLID WASTE

With the exception of one incinerator site, solid waste in Utah is disposed of at landfill sites. The Utah Bureau of Solid Waste Management, the Environmental Health Services Branch estimates that approximately 85% of these sites are not in total compliance.

The Bureau of Solid Waste Management includes three professional personnel, while the statewide workforce includes less than 300. Increases in this workforce are forecast to 1982. These increases, however, will most likely not exceed two to three percent per annum.

More emphasis will be given to enforcement and hazardous waste problems, but career potential is still limited to the standard positions. Statewide, these may include landfill operators, heavy equipment operators and collectors. This may change as resource recovery sites and established hazardous waste sites are developed. Trained engineers, geologists, and hydrologists will be instrumental in the planning, development and operation of these sites. Integrated planning between state, local, and private sectors will be needed to select proper sites and to coordinate their operation. Proper site selection for wastes generated by the mining and oil industry is an immediate priority. Five hazardous waste disposal sites, properly planned and executed, would adequately handle hazardous waste disposal in Utah.

VII. WASTE WATER

Utah's Water Pollution Control Act was passed in 1953 as the result of an intensive campaign to inform the public of the need for effective water pollution control. The Utah Division of Health, Environmental Health Services Branch, Bureau of Water Quality is the lead agency. Raw sewage discharges and overloaded treatment plants are problems which have been identified in the state.

Workforce projections for state personnel are dependent upon whether Utah assumes responsibility for certain federal programs, e.g., construction grants, over the next five years. Increases in state level staffing will occur at a per annum rate of between six percent and nine percent. Increases in operators is anticipated not to exceed five percent per annum to 1982.

Career opportunities for employment within the Bureau of Water Quality will remain the greatest for public health engineers during the next five years. In the private sector, engineers employed by consulting firms will be in demand. The Bureau of Water Quality will be subcontracting more work in the next five years, and engineers are the primary recipients.

The career potential for wastewater operators appears to be limited, at least until 1980. With additional federal funding, career potentials for operators will improve.

VIII. ENERGY

Utah has an abundant supply of energy resources which include oil shale, uranium, geothermal and high quality, low sulphur bituminous coal. A multitude of energy related projects are scheduled for the state including uranium mines and gasification plants. As in many western states, future extraction and conversion activities will be an integral component of Utah's future.

There are several agencies to which responsibilities and activities have been delegated regarding energy and pollution control and abatement. These include the Department of Natural Resources, State Planning Office and the Interdepartmental Coordinating Council for Energy Affairs.

Because Utah is an energy resource state and developmental activities impact several aspects of state and local government, the workforce involved in pollution control and abatement activities at all levels will illustrate percentage per annum increases. These increases should be approximately four percent per annum. Although no firm figures are available, the private sector should experience a five to eight percent per annum increase.

Career opportunities are expected to develop over the next three to five years for degreed and highly trained engineers, scientists, and architects in energy research, product design and development, as well as in the extractive industries. Career opportunities will be available on the technical level.

STATE OF UTAH - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)
(estimated)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR	104	110	117	124	131	139	6%
NOISE[1]	54	57	61	65	68	71	6%
PESTICIDES[2]	7,552	7,558	7,564	7,571	7,577	7,584	N/A
POTABLE WATER[3]	510	514	568	625	927	928	14%
RADIATION	96	98	101	103	106	108	2%
SOLID WASTE	277	283	289	295	301	307	2%
WASTEWATER	519	540	562	584	607	631	4%
ENERGY[4]	64	67	70	74	78	82	5%
TOTALS	9,176	9,227	9,332	9,441	9,795	9,850	2%

[1] Includes some part-time personnel.

[2] Includes no growth for state personnel and no growth for private applicators.

[3] Predicated on assumption of primacy.

[4] Does not include private sector.

EDUCATION

In 1890, the Utah State University, then called the Utah Agricultural College, opened its doors in Logan. Today, Utah State University (USU) has an approximate enrollment of 9,000 students. The University consists of 46 departments in eight academic colleges and a school of graduate studies. The majority of the environmental/energy programs currently being conducted in Utah are located at Utah State University at Logan.

The College of Engineering presently includes a program in civil and environmental engineering which leads to a Bachelor's of Science degree. The environmental engineering curriculum is interdepartmental and is basically a graduate program which offers the degrees of M.S. and Ph.D.

The USU College of Natural Resources administers an environmental studies program which leads to a B.S. degree. This program utilizes resources from across the university and is a broad based curriculum with a considerable degree of flexibility.

The USU College of Science, Department of Biology offers a B.S. degree in Public Health with an environmental health option. A B.S. degree in Applied Biology is available with the program emphasis on pest management.

In addition, USU has established the Utah Water Research Laboratory. Research is conducted which includes all areas of water resources, water quality and weather modification.

LEGISLATION

The environmental/energy legislation for Utah was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Air Conservation Act

Economic Poison Application Act of 1951

Insecticide, Fungicide and Rodenticide Act of 1951

Radiation Protection Act

Junkyard Control Act

Water Pollution Control Act

National Environmental Energy Workforce Assessment

Phase I

VERMONT

State Summary

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I. AIR

Vermont's air pollution control program is functionally located within the Division of Engineering of the Agency of Environmental Conservation. Fifteen persons currently staff the air pollution control program in Vermont. The program is staffed by engineers, technicians, air pollution control specialists, a chart reader, and secretaries. Serious consideration is being given to a reevaluation of program objectives and commitments in an effort to make a realistic determination of the future direction of the program.

Career potential in air pollution control in Vermont is expected to be limited over the next five years. As the state government is the primary employer of full-time professionals and it is anticipated that the state will not hire additional personnel because of fiscal constraints, the development of careers in this field appears to be limited. However, if adequate funding does become available, Vermont's air program has estimated that approximately five person-years will be needed to adequately staff all new program directions which have been suggested by EPA.

II. NOISE

Vermont has not enacted any statewide noise control legislation as of yet. For any matters relating to noise control problems, the Division of Industrial Hygiene of the State Department of Health has been designated as the principal contact agency in Vermont to have noise pollution problems referred to it. Their principal activities consist of responding to citizen complaints and assisting parties involved to settle any disputes through arbitration.

Unless new federal initiatives are provided, it is considered unlikely by state officials that Vermont will create a formal noise control program or capability by 1982, since noise is not considered to be a significant problem.

III. PESTICIDES

The Vermont Department of Agriculture has been designated as the state lead agency for the administration of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) as amended. The Department's Division of Plant Pest Control has program responsibility to carry out the pesticide regulatory and certification program. The Vermont Pesticide Advisory Council and the Vermont Extension Service of the University of Vermont have also been designated as cooperating agencies with the Department.

The Department's pesticide staff currently is composed of entomologists, a pathologist, field agents, and secretaries. No growth projections are currently available from program staff as it is uncertain how many restricted use pesticides will have to be regulated.

Growth in the numbers of commercial applicators will approach 325 when the certification effort is completed in the latter part of 1977. As for private applicators, it is estimated that if the restricted use list includes certain dairy pesticides not currently restricted, then about 90% of all dairy farmers will have to be certified.

IV. POTABLE WATER

Drinking water quality in the state of Vermont is regulated by both the Agency of Human Resources (AHS) and the Agency of Environmental Conservation (AEC), with the latter considered the lead agency. AEC's function involves the construction of municipal water treatment facilities. AHS is concerned with ensuring all health and hygiene aspects of public drinking water in the state and is the state's primary agency for implementation of all provisions of the Safe Drinking Water Act (SDWA) of 1974. The state has accepted the first year's role in primacy and is evaluating the possibility of accepting full primacy under the Act. The 400 community water systems in the state should be substantially upgraded under SDWA through joint cooperation between EPA and AHS.

AEC's water supply program is staffed with two environmental engineers, whereas AHS is staffed with civil and sanitary engineers, sanitarians who serve as field inspectors, and a chemist. The AHS water supply program has full-time laboratory analytical capabilities from its staff of chemists and microbiologists.

If the state assumes primacy under SDWA, it has been estimated that the program will need about four more people to ensure adequate operation. Specific growth through 1981 will be totally dependent on financial assistance available from EPA under SDWA.

V. RADIATION

Environmental radiation control in the State of Vermont is the responsibility of the Division of Occupational Health of the Vermont Department of Health. The program is primarily directed toward surveillance around the site of the Vermont Yankee Nuclear Power Plant in Vernon, Vermont, but also includes several sampling points in other parts of the state to provide background (baseline) information for comparison purposes.

The radiation control program is staffed with a director, a radiological health specialist, laboratory chemist, and a laboratory technician. In the private sector, Vermont Yankee represents the only nuclear power generating installation in the state. It has been estimated that 213 person-years of technical and professional work are spent on environmental monitoring and analysis.

It is anticipated that there will be no increases in the current staffing level over the next five years due to Vermont's austere fiscal situation. Additionally, there are no new nuclear facilities planned for the state; and, current environmental surveillance activities are not likely to increase in the near future.

VI. SOLID WASTE

Regulatory responsibility for solid waste management was assigned by the Vermont State legislature to the Board of Health; however, the administration of the program was delegated to the Agency of Environmental Conservation (AEC). Additionally, legislation has been enacted which prohibits the open burning of refuse at dumps or sanitary landfills.

In 1973, AEC published a Resource Recovery Plan which outlined a statewide plan for source separation by recyclable materials, their processing and ultimate reuse. However, due to a lack of legislative appropriations and a non-profitable secondary materials market, the plan was not implemented.

The Vermont solid waste program is located within the Division of Environmental Engineering and is currently staffed with four individuals in addition to a program chief, who has responsibilities divided between Vermont's air program and the solid waste program. The program also relies upon the Department of Water Resources Water Quality Lab and the Department of Highways' Soils Lab and soil drilling crews for laboratory analysis and sampling of municipal landfills. Solid waste disposal in the state is primarily managed by local governments.

VII. WASTEWATER

The Agency of Environmental Conservation (AEC) is Vermont's principal agency concerned with the management of wastewater facilities. Within AEC, the Department of Water Resources coordinates the state water pollution control program. The Environmental Engineering Division, also under AEC, provides the Water Resources Division with all necessary technical and engineering support and operates the state's municipal construction grants program.

The Division of Water Resources is staffed with sanitary engineers, chemists, water resource investigators, and environmental technicians. The Public Facilities Section of the Division of Environmental Engineering is staffed with environmental engineers. The total full-time workforce of the Agency of Environmental Conservation is 92. Most of the work of the Division of Environmental Engineering (about 75 percent) is under the auspices of the Water Resources Division.

The State of Vermont is currently promoting an austere fiscal program which may preclude any increased state assistance to the program. For this reason, the extent of growth or decline for the Agency's water pollution control workforce is in doubt. It is likely that the staffing level for the program will remain the same over the next five years.

VIII. ENERGY

Vermont's energy usage is, to a great extent, for space heating requirements which far exceed the national average. Energy costs in Vermont are double the national average, exclusive of the New England region. Strategies for future energy planning for Vermont are based on the philosophy that conservation measures must be stringent and accompanied by no contradictory penalties such as higher rates for low energy users.

Vermont has one nuclear power generating plant at Vernon operated by Vermont Yankee Power Corporation which generates 514 megawatts. No plans for more nuclear plants are underway at this time.

The Vermont State Energy Office was created by Executive Order in 1973 and made permanent by the legislature in the 1974 session. The 1976 staffing level was six persons. Among the Energy Office's activities are:

1) creation of a comprehensive energy program to include conservation of present resources, research and development of alternative energy sources, and planning for the most efficient and effective use of present and future energy resources;

2) development of educational programs for Vermont schools in energy conservation;

3) participation in the New England Energy Management Information System; and,

4) studies of alternative energy sources.

STATE OF VERMONT - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR[1]	15	--	--	--	--	--	N/A
NOISE[2]	1	1	1	1	1	1	0%
PESTICIDES[3]	7,339	--	--	--	--	--	N/A
POTABLE WATER[4]	468	--	--	--	--	--	N/A
RADIATION[5]	7	7	7	7	7	7	0%
SOLID WASTE[6]	5	(6)	(7)	(8)	(9)	(10)	N/A
WASTEWATER[7]	395	407	420	432	445	457	N/A
ENERGY[8]	6	--	--	--	--	--	N/A
TOTALS	8,236	--	--	--	--	--	N/A

[1] The above includes only state agency personnel. Private sector data were unavailable.

[2] The above does not include law enforcement agencies or the private sector.

[3] The above represents 9 state agency personnel, 325 commercial pesticide applicators, 5,000 private pesticide applicators, and 2,005 licensed pesticide dealers.

[4] The above reflects 18 state agency personnel and 450 water supply operators.

[5] The above includes 4 individuals of the state's environmental radiation surveillance program and 3 individuals at the Vermont Yankee Nuclear Power Facility.

[6] The above includes only state agency personnel.

[7] The above includes 92 state agency personnel for which little or no growth is anticipated. Additionally, 240 certified operators are included with a workforce increase of about five percent per year. Finally, 63 private sector wastewater personnel are included; however, growth projections for this workforce were unavailable.

[8] The above includes only state agency personnel.

EDUCATION

Marlboro College's Environmental Studies Program which is designed to lead to a degree requires a total of 120 semester equivalent credits for completion. The program was started in 1975 and is taught by a total of eight instructors. Ten students were enrolled in 1976. The program is organized into two sub-programs. The first is a special seminar open to advanced students and coordinated by all eight faculty members. The second sub-program involves actual internship experience working for government, industry, or a conservation organization.

Norwich University at Northfield offers a program in Engineering Technology (Environmental). The program was started on the Bachelor level in 1971 and on the Master level in 1972. The courses are taught by one associate professor, one assistant professor and one instructor. The purpose of the engineering technology program is to produce engineering technologists who have the technical competence to work with environmental engineers, under minimum supervision, in the detection, evaluation, and control of pollutants.

The University of Vermont began an environmental studies program in 1972. In 1976, the academic enrollment in this program was 80, with 20 graduating that year. The curriculum in Environmental Studies offers students several alternatives leading to an individualized program of study.

LEGISLATION

The environmental/energy legislation for Vermont was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Environmental Conservation Law
Air Pollution Control Act
Pesticides Control Act
Pesticide Registration Act
Municipal and County Government Water Works Law
Radiation Protection Law
Beverage Container Law
Rubbish and Garbage Law
Water Pollution Control Law
Land Use and Development Law

National Environmental Energy Workforce Assessment

Phase I

VIRGINIA

State Summary

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I. AIR

Air pollution control and abatement in Virginia is the responsibility of the State Air Pollution Control Board (SAPCB), created as an autonomous agency in 1967 with the enactment of Virginia's Air Pollution Control Law. The Board consists of five members, appointed by the Governor, and a staff whose function is the implementation of board policies. The board also includes seven regional offices located across the state.

Virginia contains seven Air Quality Control Regions (AQCR) as provided for in the State Implementation Plan (SIP). The following are included: National Capital Interstate, Eastern Tennessee-Southwestern Virginia Interstate, Central Virginia, Hampton Roads, Northeastern Virginia, State Capital, and Valley of Virginia.

Virginia's SAPCB has a current staffing level of 117 persons, although it is authorized a staff of 130. Budgetary constraints and attrition of personnel are considered to be responsible for the understaffing.

Although Virginia's SAPCB staff has decreased in number recently, (the largest number of people on the staff was 125, in 1975) program officials predict a staffing increase over the next five years. The increase will be small, averaging only four percent per year, due primarily to budget restrictions. The potential for future jobs in air pollution control at the state level in Virginia is limited at best.

II. NOISE

The environmental noise program in the Commonwealth of Virginia has been the responsibility of the Bureau of Industrial Hygiene of the State Department of Health. The Bureau is responsible for the enforcement of rules to control community noise. At present, there is only one person, a scientist, involved in the state's noise program on a half-time basis. The major function of this position is investigating noise complaints in industrial facilities, under the authority of the Occupational Safety and Health Act.

Professionals anticipate an increase to one full-time person in noise in fiscal year 1977 in order to comply with State Occupational Safety and Health Act (OSHA) regulations. Further expansion of staffing levels to three or four full-time professionals in the program is anticipated over the next two years.

Career potential in the noise program in Virginia is dependent, in large part, upon the availability of funds to expand the program over the next few years. If professional workforce projections hold true, there will be some limited career opportunity for scientists and technicians. Generally, a four-year degree will be required for scientists with acoustical backgrounds. Some specialized training in noise abatement and control will be desirable.

III. PESTICIDES

Responsibility for implementation of the pesticides program has been allocated to the Virginia Department of Agriculture and Commerce, Pest and Paint Regulatory Section, Division of Regulatory Services.

The current staffing level of Virginia's pesticide program consists of seven full-time people. These persons, professional and clerical, also have the responsibility for programs regulating paints and hazardous substances. In addition to the seven full-time persons, the pesticide program utilizes 17 agricultural field inspectors on a part-time basis. In addition to state program personnel, professionals estimate that there are 2,095 commercial applicators and 35,000 private applicators in the commonwealth that must be certified under the law.

Officials in the pesticides program have indicated that a growth in the program by about four persons in the next five years can reasonably be expected. Professionals indicated that these positions would be for full-time inspectors.

Only a limited potential is anticipated for careers in pesticides at the state level in Virginia. Although the percentage increase in the program appears to be significant, the small numbers of people involved limit the actual number of jobs available. The opportunities that do exist will be for field inspectors requiring, as a minimum, a bachelor's degree.

IV. POTABLE WATER

Authority for the protection of groundwater in the commonwealth is held jointly by the Department of Health and the State Water Control Board. The board is empowered to initiate rules and regulations governing the use and distribution of sources of goundwater, issue permits for such use, and impose penalties upon violators of the law. The Virginia State Department of Health has responsibility for the Water Supply Program through its Bureau of Sanitary Engineering. The program goal is to ensure the provision of safe and sanitary drinking water to all citizens.

At the state level, there are currently 38 persons working in water supply, not including members of the State Water Control Board. At the local level, there are approximately 1,500 water treatment operators.

Professional estimates indicate that the workforce in water supply at the state level in Virginia will nearly triple over the next five years. At the local level, the number of water treatment plant operators in the commonwealth is expected to increase significantly during this period.

Career opportunities in water supply in Virginia over the next five years appear promising. An increase in demand for engineers is anticipated, as well as for chemists and technicians. An expected increase in the number of water supplies in the state will result in an increased demand for certified operators.

V. RADIATION

Virginia has a permissive state statute which grants it the right to enter into agreement-state status with the Nuclear Regulatory Commission that would allow the state to assume greater responsibility in controlling radioactive materials. To date, Virginia has not obtained agreement status with the Nuclear Regulatory Commission (NRC). There are currently two nuclear electric generating plants in operation, and six more are planned or under construction.

Responsibility for the Virginia radiation program has been allocated to the State Department of Health, Bureau of Industrial Hygiene Radiological Health Section. At the state level, there is only one person currently employed in the radiation program. This person is a scientist and does not spend full-time in environmental radiation control activities.

Professionals in the field of environmental protection predict a very slight increase in workforce at the state level over the next five years. This increase will occur principally in three areas: nuclear power, radioactive waste disposal, and control of radiation from naturally-occurring sources. No regulatory program exists at present to control naturally-occurring radiation, but plans are being formulated to establish standards. This is the largest single source of population exposure to radiation, and the only source that has not received extensive study.

VI. SOLID WASTE

The solid waste management problem in Virginia was recognized in 1965 with a resolution by the State Health Department to require local communities to notify the Department of their solid waste management plans.

Of the Virginia land area, 75% is considered to be rural. The availability of land makes landfilling the most common means of disposal. Since state regulations became effective, 197 sanitary landfills have received permits. Of these, 148 (75%) are publicly owned and operated while the remaining 49 are privately owned and operated.

Other methods of dealing with solid waste in Virginia include incineration and resource recovery. One resource recovery facility is already in operation, and a second is in final construction stages.

The Bureau of Solid Waste and Vector Control has a current staffing level of ten people. This is indicative of a major increase in the program since, for most of its history, the program consisted of one person. Officials have indicated that there is generally one operator for each landfill and, therefore, there are at least 200 operators in the state.

Potential for careers in solid waste management in Virginia is described as limited, at best. Even though the state program will increase, few new jobs will be created.

VII. WASTE WATER

Almost all of the communities in Virginia have sewage treatment and most have secondary or higher levels of treatment. Under the permit system, all industrial plants have installed waste treatment systems, and most are considered to be relatively effective by professionals working in the program. There are estimated to be about 600 municipal waste treatment facilities in Virginia and an almost equal number of private facilities.

All authority for water quality or waste water programs in the Commonwealth of Virginia is vested in the State Water Control Board (SWCB). The board was established in 1946, with the enactment of water pollution control legislation. the State Water Control Board is composed of four program bureaus: the Office of the Executive Secretary, the Planning and Administration Section, and six regional offices. The majority of environmental jobs are located in the program bureaus and regional offices. The SWCB is composed of 345 persons.

Program officials estimate that there are 1,283 certified waste water treatment operators in the state and that this represents about half of the total number of operators in Virginia. Each certified facility must have at least one certified operator.

Growth in terms of SWCB personnel is expected to be low. Program managers anticipate the program to increase by about three to five percent over the next five years.

VIII. ENERGY

The Virginia Energy Office was created by an Executive Order of the Governor on September 6, 1974, to administer the State set-aside program for hardship and emergency allocation requirements and other programs which may later become necessary. It currently has a total staff of eleven persons and one position, that of deputy director, is currently vacant.

The Energy Office is anticipating increasing its staffing level to twenty persons within the next two years. The primary reason for staff growth is to implement the mandates required for formation of state energy and conservation plans under the Federal Energy Policy and Conservation Act. The Energy Office expects to recruit a technical services coordinator, a government programs coordinator, a communities and industrial programs coordinator, an assistant technical services coordinator, several assistants, and clerical support personnel.

COMMONWEALTH OF VIRGINIA - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR [1]	117	122	127	131	136	140	4%
NOISE [2]	1	1	1	3	3	4	47%
PESTICIDES [3]	7	8	9	10	11	11	10%
POTABLE WATER [4]	38	52	66	81	94	110	24%
RADIATION [5]	1	1	2	2	3	3	30%
SOLID WASTE [6]	10	10	13	15	18	20	15%
WASTEWATER [7]	1628	1846	2070	2294	2518	2741	11%
ENERGY [8]	11	15	20	20	20	20	14%
TOTALS	1,813	2,055	2,308	2,556	2,803	3,049	11%

[1] The above represents only personnel of the State Air Pollution Control Board.

[2] The above does not include law enforcement agencies or the private sector for which figures were not available.

[3] The above includes state program personnel, but does not include an estimated 2,095 commercial and 35,000 private applicators that will require certification.

[4] The above does not include an estimated 2500 water supply and water treatment plant operators that will be required over the next five years.

[5] The above includes only state agency personnel.

[6] The above does not include private sector personnel for which figures were not available.

[7] The above includes both state agency personnel and certified wastewater treatment plant operators.

[8] The above includes only state energy agency personnel.

EDUCATION

The colleges and universities in Virginia have a variety of environmental education programs. Two notable programs are those of Virginia Polytechnic Institute and the J. Sargeant Reynolds Community College.

Virginia Polytechnic Institute offers both a Master of Science and a Ph.D. program in Civil Engineering with Environmental Emphasis. The programs are located at the Institute's campus in Blacksburg and include several environmental courses such as environmental engineering chemistry, environmental health, air pollution, and the design of water and sewer systems.

The J. Sargeant Reynolds Community College, located just outside Richmond, offers an Associate of Science Degree in Environmental Technology, with options in Environmental Health and Environmental Engineering. Reynolds has also been instrumental in working with the State Water Control Board and the Department of Health in the development and operation of the Virginia Wastewater Treatment Plant Operator Center. Although the Center is located at Reynolds, courses are taught both at Reynolds and at fifteen other community colleges throughout Virginia.

In addition to the above schools, the University of Virginia has both undergraduate and graduate programs in environmental sciences, Emory & Henry College offers a program in environmental studies, Virginia Military Institute and Hampton Institute have courses in environmental engineering, and Old Dominion University offers a program in environmental health.

LEGISLATION

The environmental/energy legislation for Virginia was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Environmental Impact Report Law
Environmental Quality Act
Air Pollution Control Law
Pesticide Use and Application Act of 1975
Pesticide Law
Groundwater Act of 1973
Solid Waste Disposal Law
State Water Control Law
Water and Wastewater Works Operators Law
Water Pollution Control Laws

National Environmental Energy Workforce Assessment

Phase I

WASHINGTON

State Summary

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I. AIR

The Air Programs Office of the Department of Ecology (DOE), is responsible for the control and abatement of air pollution. As an adjunct to the state programs, local air pollution control authority is vested in county or multicounty equivalents of DOE.

Presently state and municipal air pollution control activities involve a professional workforce of 93. Industrial air pollution control and abatement activity is estimated to involve 200 professional and technical personnel. Professional disciplines comprising this workforce include engineers, chemists, meteorologists, and technicians.

Many of these individuals have been involved with the environmental aspects of air pollution for a relatively short period of time. This problem, prompted by the recent development of pollution control technology, has created a need for upgrade training at all levels. Constrained by time, money and program availability, this enrichment training goal may not be met.

In 1976 the Office of Air Programs offered training via workshops in plume opacity, high volume sampling, carbon monoxide, and sulfur dioxide for 283 attendees.

Workforce projections indicate a limited growth at the state regulatory level, estimated to be about two percent over the next five years. This figure excludes the municipal effort for which projections were not available.

II. NOISE

The Department of Ecology, Office of Land Programs, Noise Control Section, is the state authority responsible for the control and abatement of noise pollution. DOE workforce activity in noise pollution control involves the full-time efforts of one professional acoustical engineer.

In addition to the state regulatory workforce, engineering consultant firms provide professional expertise to industrial concerns relating to noise specifications in architectural design. However, due to the competitive nature of consulting activities, specific workforce figures were not available in this area.

Municipal enforcement of noise regulations is carried out through state patrol and local city police. At present, eleven cities have adopted noise control ordinances which involve nuisance, zoning, vehicle, recreation vehicle, railroad, aircraft, construction, and building noise pollution standards.

No workforce increases are anticipated to occur over the next five years at the state regulatory level.

Further, in review of limited state activities, the noise effort is expected to continue to be a low priority program. Other noise-related activities, e.g., municipal ordinances, zoning standards, will continue to involve local enforcement bodies which include noise activities as a part of their regular responsibilities.

III. PESTICIDES

The Department of Agriculture, Pesticides Division, is the prime authority responsible for the control and abatement of pesticide misuse and pollution. This agency administers the registration and licensing of pesticide dealers, applicators, and operators. The total staffing level currently involves eleven professional positions.

Approximately 45 pesticide specialists are employed by the Cooperative Extension Service, which provides training services to dealers, applicators, and farmers in preparation for licensing exams.

Private sector workforce activity involves 3,464 pesticide operator/applicator personnel. It has been estimated that 20,000 private farmers will be certified to use restricted-use pesticides in the next five years.

The Department of Agriculture expects no growth increase to occur in the state regulatory workforce. Growth in the number of commercial applicators will be approximately 12 percent per year, however, this estimation could be dramatically lowered as poor weather conditions could hamper agricultural activity in the years to come.

The provision of training pursuant to certification of personnel is expectedly the most important task facing pesticide regulatory authorities at this time.

IV. POTABLE WATER

The Department of Social and Health Services (DSHS) is considered to be the principal authority responsible for maintaining high water supply quality standards in Washington.

The water supply program of DSHS is carried out through its headquarters in Olympia and regional offices in Seattle and Spokane. A total of 29 professional and technical personnel are involved in the water supply program, with the majority of positions filled by sanitary engineers.

Because Washington has yet to establish a mandatory certification program and has only a voluntary certification process, the number of operators holding certificates is fewer than if certification were mandatory. Mandatory certification is anticipated within the next two years. Statewide, there are a total of 1,250 operators who have been certified in accordance with the Association of Boards of Certification Standards.

There are an additional 30 professionals working in water supply through the county health departments. This workforce consists primarily of personnel degreed in sanitary engineering.

In total, there are approximately 1,400 persons in Washington working in the field of water supply, combining both public and private sectors.

Workforce projections indicate no growth at the public level. The number of certified water treatment personnel is expected to increase by 300 over the next five years, thus indicating a definite need for training activity.

V. RADIATION

Regulatory responsibility for radiation control is vested in the Washington Department of Social and Health Services.

At the present time, DSHS has a staff of eight professional personnel conducting all regulatory activities in this area. Although no growth in staff is expected to occur over the next five years, sources have indicated that the workload will continue to increase as licensing and registration activities involve an ever growing number of facilities.

An estimated 134 radiation control technicians are involved in radiation pollution control at the private sector level.

Training for DSHS employees is partially accomplished through ERDA seminars and courses offered by the Nuclear Regulatory Commision. Communication among professional staff members provides for a continuous exchange of state of the art knowledge and for new personnel represents on-the-job training potential.

One of the major concerns to public health officials is the increasing use of nuclear power for electrical generation and its by-product of nuclear waste. The proper handling, transportation, and storage of this waste will require extensive planning in the beginning and equally diligent monitoring during and after storage has been accomplished. All of these activities will provide career opportunities in the future.

VI. SOLID WASTE

The Department of Ecology, Solid Waste/Resource Recovery Division, has been assigned primary responsibility for the control and abatement of solid waste pollution.

DOE maintains a solid waste divisional staff of 25 professionals. This staff is comprised of engineers, sanitarians, scientists, and public relations specialists.

Private sector disposal workforce activity has been estimated to involve some 300 people. This workforce includes landfill owner/operators, heavy equipment operators, and weighmasters.

The private sector workforce profile involving waste collection personnel has been estimated to include some 1,200 people. These collection service personnel work under a franchise system and provide collection services to specific population centers. Personnel in this workforce include drivers, jumpers, and occasionally, heavy equipment operators.

In response to the Resource Conservation and Recovery Act of 1976 and the growing volume of solid waste being produced, DOE anticipates increasing its staff by five professionals over the next five years. Private sector workforce projections indicate an increase of 900 persons over the next five years. In conjunction with increases in staff in the public and private sector, extensive training activity is also expected to develop. This will provide for effective implementation of the state solid waste management plan.

VII. WASTE WATER

The principal regulatory authority responsible for the control and abatement of waste water pollution is vested in the Office of Water Programs, DOE.

The current staffing level of the office involves 53 professional personnel. This workforce is made up of engineers, technicians, scientists, and administrative personnel.

Private sector workforce activity is estimated to include 1,266 persons, comprised primarily of waste water treatment plant operators.

Waste water treatment plant operator training and certification activities are considered to be a major component in the effort to provide efficient treatment facility operation.

Workforce projection information indicates little or no growth at the state level. However, private sector workforce levels are expected to increase by 975 over the next five years. This increase is the result of continued facility construction and upgrade construction at existing facilities.

Sources in the field have suggested that the proper training and certification of operator personnel may increase the efficiency of a treatment plant by 50 percent. This would indicate that operator training in the future will become an important component in the effort to eliminate water pollution in Washington.

VIII. ENERGY

The Washington State Energy Office, in conjunction with the State Energy Advisory Council, is responsible for the development and implementation of programs designed to provide guidance and planning concerning energy production, conservation and conversion activities.

At present, the office is staffed by ten professional personnel. Although future activity is extremely dependent upon federal funding, considering an optimum situation, the State Energy Office could feasibly increase its staff to 40 professional positions within the next five years.

Sources in the field have indicated that the effects of the energy extension services concept, the weatherization program, and the RCRA of 1976 will all provide growth potential for their office programs and staff necessary to accomplish those programs. Positions to be added will include engineers, public information specialists, nuclear specialists, administrators, and generalists with B.A./B.S. backgrounds.

The Washington State Energy Office offers assistance and information concerning energy conversion and conservation, but offers no specific training programs. Personnel training is developed primarily through structured university programs and experience in the field. Energy seminars may be developed in the future to promote energy conservation in the public sector.

STATE OF WASHINGTON - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR[1]	227	275	315	355	390	430	14%
NOISE[2]	1	1	1	1	1	1	0%
PESTICIDES[3]	11	11	11	11	11	11	0%
POTABLE WATER[4]	1,279	1,347	1,411	1,489	1,531	1,573	4%
RADIATION[5]	163						n/a
SOLID WASTE[6]	325	397	465	539	582	630	14%
WASTEWATER[7]	1,259	1,486	1,650	1,764	1,926	2,134	11%
ENERGY[8]	10	20	25	30	35	40	35%
TOTALS	3,275	3,537	3,878	4,189	4,476	4,819	8%

[1] The above does not include 66 municipal positions for which projections were not available (re: Washington report).

[2] The above does not include law enforcement agencies or the private sector for which figures were not available.

[3] The above includes 11 state staff, but does not include 3,464 licensed applicators/operators, 1,373 commercial and public pest control consultants, or the estimated 20,000 farmers who may be certified by October, 1977. The only anticipated growth is 12% per annum for commercial applicators/operators.

[4] The above does not include laboratory personnel. Of the figures, the state agency segment is 29 in 1976 and 23 in 1981. (re: Washington report).

[5] The above includes 8 state agency personnel and 155 technicians statewide. Projections were not available.

[6] The above reflects 25 state agency personnel in 1976 and 30 by 1981. The remainder are disposal personnel.

[7] The above includes 53 state agency personnel for which no growth is anticipated. The figures do not include laboratory personnel.

[8] These projections are entirely dependent upon future federal funding. If funding continues, the office may have 40 personnel by 1981.

EDUCATION

Environmental education is offered through various educational disciplines in approximately 75% of the post-secondary institutions in Washington State. Although the majority of institutions offer environmentally-related courses, only three offer programs large enough to impact the future workforce.

The Washington State Council for Post-secondary Education identified these institutions: (1) University of Washington, Seattle; (2) Huxley College of Environmental Studies, Bellingham; and (3) Evergreen State College, Olympia. These schools utilize different approaches to environmental education. The University of Washington offers numerous courses in a variety of disciplines under the traditional system of education within the University structure. Huxley College offers several concentrations aiming the student at a particular discipline within Huxley, which is a cluster college of Western Washington State College, and offers strictly environmental science courses. The third and most untraditional of the three institutions is Evergreen State College. It offers self-designed majors with emphasis on field work.

The State Report provides an analysis of the programs available through Green River Community College and Huxley College of Environmental Studies.

LEGISLATION

The environmental/energy legislation for Washington was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Department of Ecology Law
Environmental Coordination Procedures Act
Clean Air Act
Noise Control Act of 1974
Pesticide Application Act
Pesticide Control Act
Nuclear Energy and Radiation Law
Hazardous Waste Law
Model Litter Control Act
Solid Waste Management Act
Water Pollution Control Law
Water Resources Act of 1971
Water Code of 1917
State Energy Office Law
Shoreline Management Act of 1971

National Environmental Energy Workforce Assessment

Phase I

WEST VIRGINIA

State Summary

I. AIR

In West Virginia, the two most serious pollutants are particulates and sulfur oxides. The largest sources of these pollutants are power generating plants, metallurgical furnaces, and coal and oil fuel burning units.

The West Virginia air pollution control law was enacted in 1961. The law created a separate state agency composed of a seven member commission, known as the West Virginia Air Pollution Control Commission (WVAPCC), to implement the program. Subsequently, West Virginia was divided into ten Air Quality Control Regions (AQCR), four interstate and six intrastate.

The West Virginia Air Pollution Control Commission has a staffing level of 59 persons at present, of which fifteen are classified as engineers. Statewide staffing levels were not available at this writing.

The WVAPCC program officials indicate that staffing levels can be expected to increase to about 100 persons, or a gain of 41, over the next five years. This estimate of increased needs is based in part on the anticipation that U.S. EPA will be requiring the state to regulate additional emissions. The major occupational increase will occur among engineers with only a small demand for those in other occupations. Generally it is believed that engineers with differing specializations will continue to be utilized.

II. NOISE

There is currently no active noise program in the State of West Virginia. The State Department of Health has been delegated authority over noise activities in the state, but there are currently no noise standards to enforce by law. The only existing noise restriction in the state applies to motor vehicle mufflers. Consequently, at present there are no state or local personnel involved in noise control activities.

Workforce projections for noise activities in the state are unapproachable at this time, due to the fact that no noise program exists, and future plans for the establishment of a noise program are as yet undetermined. Noise legislation has been introduced several times but, to date, has failed to be passed by the state. legislature. It is conceivable that with the inception of a noise program in the state at some future date, there would be a demand for personnel with backgrounds in engineering, acoustics, and some sciences, such as physics.

The creation of a program in West Virginia in the future would most likely be contingent upon both the recognition of noise as a real environmental problem on the part of the state legislature, and the availability of federal funds to support the program.

III. PESTICIDES

The West Virginia pesticide control program is the responsibility of the State Department of Agriculture. Within the Department, program responsibilities are divided between the Plant Pest Control Division which has implementation and enforcement activities and the Consumer Protection Division which handles dealer licensing, certification, and pesticides registration.

The current staffing level of West Virginia's pesticide program consists of three people, two of whom are located in the Plant Pest Control Division and one in the Consumer Protection Division. In addition to state program personnel, professionals estimate that there are 2,048 commercial applicators and 28,984 private applicators in the state that must be certified under the law.

Program officials in the Plant Pest Control Division have estimated that the pesticide program must double in staff size in order to do an adequate job. It is estimated that two additional persons would be hired and that they would be employed by 1978. Projections for the applicator category were unavailable at this writing.

Potential for careers in pesticides in West Virginia is anticipated to be very limited over the next five years. The opportunity that does exist is expected to be for professionals with an educational background in the natural sciences.

IV. POTABLE WATER

Responsibility for the administration of the potable water program has been allocated to the Environmental Health Service, West Virginia Department of Health. The program's activities are concerned with the implementation and enforcement of the federal Safe Drinking Water Act (SDWA). The State of West Virginia has assumed primacy under the Act for its implementation and enforcement.

The current staffing level of the potable water program is 24. Statewide workforce figures were unavailable at the time of this writing.

Projected growth in the water supply program is expected to increase significantly over the next five years according to professionals working in the program. The present level is anticipated to increase at a rate of 15 percent per year, which would double the size of the workforce. The largest demand would be for engineers. The future for plant operators and laboratory personnel also seems to hold some promise. Although specific growth figures are not available, new legislation will demand increases in both areas. Generally, operators and laboratory personnel might anticipate a ten percent per annum growth potential.

Projections indicate that careers in potable water in West Virginia will be significant at the state level. Opportunity will be available to engineers, along with some demand for persons with professional training in chemistry and biology.

V. RADIATION

Responsibility for radiation control has been allocated to the Bureau of Industrial Hygiene, Environmental Health Services, State Department of Health.

The radiation program in the State of West Virginia currently is not involved in environmental sampling, and none is anticipated for the future. State personnel conducted some air sampling until two years ago. The program does have monitoring capabilities, but program activities are directed primarily toward medical radiation, including surveys of X-ray equipment.

West Virginia has not entered into an agreement with the Nuclear Regulatory Commission (NRC) whereby certain of the Commission's responsibilities could be assumed by the state. However, state personnel often accompany NRC inspectors on visits to the 131 licensed sites.

There is only one person, a scientist, currently employed in the radiation program at the state level. Statewide staffing figures were unavailable at this writing.

There will be a moderate increase in career opportunities in radiation at the state level over the next five years due to the fact that the program is obliged to commence activities to ensure state compliance with federal regulations. These opportunities will exist for scientists and technicians at the degreed level. There will also be some demand for clerical personnel.

VI. SOLID WASTE

In 1970, West Virginia adopted a state Solid Waste Management Plan. This plan, prepared under a grant from EPA, recommended the concept of regional waste management planning and the need for an autonomous waste management agency. The program is administered within the Environmental Health Service of the State Department of Health.

Program personnel have indicated that landfills are the only feasible method for solid waste disposal at present. It is cheaper than other acceptable disposal methods and West Virginia's population is located mainly in rural areas and small towns which are not likely areas for resource recovery facilities. There are 42 sanitary landfills in the state that meet state standards and have permits. It is estimated that there are an additional 260 open dumps operating without permits.

State level personnel include eight professionals, mostly sanitarians. Although there are no firm figures available, additional workforce in solid waste exists at the community level in landfill operations and waste collection and in the private sector in landfill operations, collection, and resource recovery.

The solid waste program has had a stable workforce level for the past several years. Over the next five years, however, staffing is expected to double.

VII. WASTEWATER

The Division of Water Resources, Department of Natural Resources, administers and enforces the West Virginia water laws to control the pollution of surface and groundwaters. District offices are located in Romney, Nitro, Parkersburg, Fairmont, and Beckley, and a laboratory in Elkins.

The current staffing level of the wastewater program consists of 107 people in the Division of Water Resources. Program officials have indicated that there are about 500 certified wastewater treatment plant operators in West Virginia. Approximately 50% work in municipal sewage plants and 50% in industrial waste treatment. In addition, there are estimated to be about 225 non-certified operators.

Projected growth in the wastewater program is expected to be substantial, about nine percent per annum to 1982. Although exact workforce projections for wastewater treatment plant operators was not available, program officials indicated that there will be an increase possibly at a rate of about 10% per annum over the next five years.

Projections indicate that the potential for careers in wastewater are good in West Virginia. Most of these will require professionally trained persons. Additionally, some opportunities will exist for those who do not have college degrees.

VIII. ENERGY

West Virginia is second to Kentucky in bituminous coal production. The more than 100 million tons produced annually account for 17% of the nation's total coal production. The state is the largest producer of natural gas east of the Mississippi River.

West Virginia's economy has long been dependent upon energy production, especially coal. More than 1,000 mines are operating in 34 of the 38 counties. In addition to the extrusive deep mine operations, more than a quarter of a million acres have been strip mined.

The Fuel and Energy Office was established to:

- provide current information regarding energy availability and distribution;
- act as liaison between citizens, industry and government agencies;
- promote and implement long and short-term energy conservation program;
- provide a public information program to citizens on energy conservation;
- develop educational programs;
- recommend energy legislation;
- forecast possible state energy shortages and develop contingency plans; and,
- administer the fuel allocation program.

STATE OF WEST VIRGINIA - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR[1]	59	66	75	82	91	100	11%
NOISE[2]							N/A
PESTICIDES[3]	3	3	5	6	6	6	17%
POTABLE WATER[4]	22	30	38	44	47	47	15%
RADIATION[5]	1	1	1	4	4	4	60%
SOLID WASTE[6]	8	8	8	9	11	11	8%
WASTEWATER[7]	107	116	125	138	151	165	9%
ENERGY[8]							N/A
TOTALS	202	224	252	283	310	333	11%

[1] The above includes only employees of the West Virginia Air Pollution Control Commission.

[2] No figures are available since there is currently no active noise program.

[3] The above includes state program personnel, but does not include an estimated 2,048 commercial and 28,984 private applicators that must be certified.

[4] The above does not include water supply and water treatment plant operators.

[5] The above includes only state agency personnel.

[6] The above does not include private sector personnel.

[7] The above does not include an estimated 275 wastewater treatment plant operators.

[8] No figures were available at the time of the preparation of this report.

EDUCATION

West Virginia has a limited number of environmental education programs offered by colleges and universities. Two notable programs are those of Glenville State College and Parkersburg Community College.

Glenville State College offers an Associate in Science Degree in Environmental Technology. Courses offered include air quality analysis, water quality analysis, reclamation problems and techniques, solid waste disposal, and environmental planning and development. The Parkersburg Community College has a certificate program in Environmental Engineering Technology. The courses offered include introduction to environmental technology, environmental health, wastewater treatment, air pollution control, and public health and pollution control law.

In addition to the above schools, West Virginia University offers undergraduate courses in air pollution, solid waste disposal, waste treatment, water resources, and radiological health in the civil engeneering program and graduate courses in air pollution, solid waste disposal, waste treatment, water treatment, and radiological health. The Davis & Elkins College in Elkins has an undergraduate program in Ecology and Environmental Science leading to either a B.S. or B.A. degree.

LEGISLATION

The environmental/energy legislation for West Virginia was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Air Pollution Control Law
Pesticide Use and Application Act of 1975
Pesticide Act of 1961
Roads and Highways Beautification Law
Solid Waste Disposal Law
Solid Waste Authority Act
Water Pollution Control Act
Surface Mining Act

National Environmental Energy Workforce Assessment

Phase I

WISCONSIN

State Summary

I. AIR

On the state level, air pollution control activities are handled by the Wisconsin Department of Natural Resources, Division of Environmental Standards, Bureau of Air and Solid Waste Management, Air Management Section. The Section has a permanent professional staff of 57 persons, with nine additional temporary positions funded through Title X monies. During the next five years six positions will be added to the professional staff; however, this does not represent real staff growth, but rather it is conversion of six Title X employees to permanent staff status. The local air pollution control programs are staffed with a total of ten professionals. No growth is expected in the local agencies during the next five years.

Sources estimate that there may be up to 200 professionals working in air pollution control in industry. Professions include engineers, chemists, meteorologists, and computer specialists. Field research further suggests that there may be a technical workforce of approximately 250, most of whom do not devote full time to air pollution control. Growth in the private sector during the next five years will be quite limited. Some growth will occur as new plants are built and as air pollution standards become more stringent. Sources suggest that growth in the professional positions will be approximately 5% per annum, and that the technical workforce will increase by about 10% annually. There are an estimated 30 consultants in the state, and a growth of 5% per annum is predicted for the next five years.

II. NOISE

The Wisconsin Department of Transportation appears to be the most active state agency in environmental noise control and abatement. Within the Department, two divisions, the Division of Aeronautics and the Division of Highways, are involved in noise control. The Division of Highways has a professional staff of five; one civil engineer has full-time responsibility for noise control. The Division of Aeronautics employes three environmental engineers who devote part of their time to research and planning for airport noise control. The Division of Aeronautics expects staff growth during the next five years; however, the extent of staff expansion cannot, at present, be accurately determined. No growth is predicted in the staff of the Division of Highways.

The Wisconsin Department of Health and Social Services, Bureau of Environmental Health, Occupational Health Section administers the industrial noise control program for OSHA. The eleven member staff allocates a small fraction of its time to monitoring and enforcement of industrial noise control regulations. Limited growth is expected in this program over the next five years.

There appears to be a small workforce employed to control industrial and environmental noise within the private sector. These persons are often industrial hygienists for whom noise control is frequently an adjunct to other industrial health activities. No specific statistics are available on this segment of the workforce.

III. PESTICIDES

The Wisconsin Department of Agriculture, Plant Industry Division, Bureau of Special Services is the primary organization responsible for enforcing regulations concerning pesticide usage. The Bureau has a professional staff of twelve; approximately five person-years of effort per year are devoted to the pesticide program. This support is provided by eight agricultural scientists, an entomologist, and a biologist. Over the next five years, sources anticipate limited growth in the Bureau's program staff. Two agricultural scientists may be added to its field inspection staff during 1977.

Other state agencies involved in pesticide usage and control include the Department of Health and Social Services, the Department of Natural Resources, the University of Wisconsin Extension, and the Laboratory of Hygiene. An estimated 172 professional staff members of these agencies have pesticide related functions. No staff growth is expected in any of these programs during the next five years.

The pesticide-related private sector workforce consists of an estimated 4,500 commercial applicators and 112,000 farmers. Sources indicate that up to 80,000 private applicators, e.g., farmers, may require certification to achieve compliance with federal and proposed state legislative requirements. Specific workforce projections for the private sector cannot be made with sufficient accuracy.

IV. POTABLE WATER

The Wisconsin water supply activities are administered by the Wisconsin Department of Natural Resources, Bureau of Water Quality, Public Water Supply Section and Private Water Supply Section. The Water Supply Program is currently staffed by 20 full-time professionals and 19 temporary positions funded through Title X monies. The permanent staff of the program is expected to increase to 27 by 1977 and stabilize thereafter. Four of the positions represent a conversion of Title X workers to permanent staff members. The remaining Title X positions will most likely be eliminated after 1977.

The Wisconsin Laboratory of Hygiene, Environmental Science Section and Water Chemistry Unit employ 18 professionals whose functions include water supply activities. No growth is expected in the Laboratory's water supply program during the next five years.

Field research suggests that there may be up to 2,000 professional, technical, and labor personnel employed in the municipal water supplies. To the 2,000 persons, approximately 1,445 are certified treatment plant and water distribution system operators. Sources estimate that the number of operators will grow by approximately 8% annually during the next five years. While there may be some growth in the supportive staff in the municipal systems, no estimates of the extent of the increase are currently available.

V. RADIATION

Principal responsibility for radiation protection is vested in the Wisconsin Department of Health and Social Services, Bureau of Environmental Health, Radiation Protection Section. The Section has a professional staff of five persons: 1 administrator, 1 physicist, 1 chemist, and 2 technicians. Over the next five years, the Section anticipates adding three positions to its staff one radiation consultant, one health physicist, and one laboratory technician or chemist. The addition of these three positions will be precipitated by the construction of two additional nuclear power plants.

The State Laboratory of Hygiene has a Radiation Protection Unit staffed by one chemist. The Laboratory of Hygiene may add one or two chemists when the nuclear power plants begin operation.

Limited information is available on the radiation-related private sector workforce. There are 87 facilities using industrial X-ray devices; each facility is required to employ a safety officer. The safety officer most generally has a background in industrial hygiene. There are 1,007 hospitals and 300 clinics using medical diagnostic machines. Many of these facilities employ a person who is charged with the responsibility of care and supervison of equipment. Little growth is anticipated in the workforce involved with industrial use of X-ray equipment. However, some growth is predicted in the private sector workforce as the nuclear power plants become operational.

VI. SOLID WASTE

The Wisconsin Solid Waste Management Program is administered by the Wisconsin Department of Natural Resources, Bureau of Air Pollution Control and Solid Waste Management, Solid Waste Management Section. A total of 24 permanent professional staff members are employed at the central headquarters and five district offices. The Section also employs ten Title X personnel. The Section estimates an average annual increase in staff of approximately 7%; however, most growth will result from the conversion of Title X employees to permanent staff positions.

The Wisconsin Solid Waste Recycling Authority has an authorized professional and clerical staff of forty; however, to date, only five of the positions have been filled. The Authority will be hiring approximately 35 more professionals over the next five years.

The private sector solid waste collection and disposal workforce currently has an estimated staffing level of 4,710 persons, with approximately 4,000 in the collection field and 710 in the disposal programs. During the next five years, growth is projected for the collection system workforce. The 2% growth in the workforce employed in collection will result from the increase in the volume of solid waste generated. Employment in disposal is expected to remain fairly constant.

A resource recovery facility, located in Milwaukee, will employ up to 68 persons, and a second facility scheduled for operation in 1979 will employ an estimated 30 persons.

VII. WASTE WATER

The Wisconsin Department of Natural Resources, Bureau of Water Quality has regulatory responsibility for the state waste water pollution control program. The current permanent professional and technical staffing level of the central and six district offices is 148. In addition, there are 22 temporary Title X employees who provide support to the program. Approximately 10 professional positions will be added to the permanent staff during the next five years; however, the growth represents a conversion of 10 Title X employees to permanent staff status. Ten of the Title X employees will probably be dropped after 1977.

Eighteen professionals employed through the Wisconsin Laboratory of Hygiene provide support to the waste water pollution control program. No growth is expected in the Laboratory's waste water program during the next five years.

Field research indicates that approximately 3,000 persons are employed in waste water treatment operations in Wisconsin. Of the 3,000 persons, an estimated 1,849 are municipal treatment plant operators and 110 are industrial treatment plant operators. The remaining persons include administrative, maintenance, and laborer personnel. Growth is expected in the demand for certified plant operators; specifically, from 850 to 1,000 new operators may be certified during the next five years. The demand for certified operators for industrial systems may also increase.

VIII. ENERGY

The Energy Section of the Office of State Planning and Energy is the principal state energy agency. The Section has a professional staff of six members: two with backgrounds in management, one physicist, one systems analyst, one computer programmer, and one petroleum allocation specialist. The Section anticipates hiring an engineer during 1977; however, following this staff addition, the staffing of the program is expected to stabilize for the next five years.

Limited information is currently available on the private sector energy related workforce. The electric utilities generally employ from one to two engineers whose functions include developing energy conservation programs. The utilities may also employ several non-degreed persons who, among their other responsibilities, conduct energy audits for homes and businesses.

State legislation which would require the electric utilities to establish energy conservation programs is now being considered by the Wisconsin State Legislature. If adopted, growth in the conservation staff within the electric utilities is anticipated. In addition, growth is also expected in the demand for solar engineers. Career opportunities are expected to grow for highly trained scientists and engineers in solar energy research. The demand for persons with training in the alternative energy sources field will continue to grow through the next ten years.

STATE OF WISCONSIN - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR	556	599	640	683	730	781	7%
NOISE[1]	19	19	19	19	19	19	n/a
PESTICIDES[2]	184	186	186	186	186	186	n/a
POTABLE WATER	2,057	2,199	2,323	2,463	2,603	2,743	6%
RADIATION[3]	6	6	7	7	11	11	n/a
SOLID WASTE	4,749	4,904	4,989	5,104	5,179	5,257	2%
WASTEWATER	3,147	3,317	3,477	3,647	3,817	3,987	5%
ENERGY[4]	6	7	7	7	7	7	n/a
TOTALS	10,724	11,237	11,648	12,116	12,552	12,991	4%

[1] Some growth is anticipated in state noise programs; however the extent of the increase cannot be accurately determined. No data is currently available on noise programs within the private sector.

[2] The above estimate includes only the state agencies' workforce projections. There are an estimated 4,500 commercial applicators and 112,000 farmers in the private sector utilizing pesticides.

[3] Limited information is available on the private sector; consequently, private sector projections are not incorporated into the above estimate.

[4] No information is currently available on the private sector energy-related workforce.

EDUCATION

Diverse environmentally-related curricula are available through Wisconsin's colleges and universities. Numerous community colleges and vocational technical schools offer training in environmental disciplines. Among the colleges offering associate degrees are: Milwaukee Area Technical College, Environmental Health Technology; Southwest Wisconsin Vocational-Technical Institute, Municipal Engineering; Moraine Park Technical Institute, Water and Wastewater Technology; and Austin Community College, Environmental Technology.

The various campuses of the University of Wisconsin offer environmental options in engineering and science programs. The University of Wisconsin, located at Madison, awards Master's degrees in Civil and Environmental Engineering with three environmental options: Structural Engineering, Water Resources Engineering, and General Civil and Environmental Engineering. Within these programs, courses are available in solid waste, potable water, wastewater, air pollution, and structural techniques used in environmental pollution control and abatement. The University also offers a Master's in Water Resources Management and a Master's and Doctoral program in Water Chemistry.

Another example of an excellent environmental education program is the environmental options available through Northland College. The College provides an environmental emphasis option in nearly every program area.

LEGISLATION

The environmental/energy legislation for Wisconsin was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Governmental Environmental Impact Statements Law
Water, Ice, Sewage and Refuse Law
Wisconsin Pesticide Law
Pure Drinking Water Law
Radiation Protection Act
Solid Waste Recycling Authority Act
Solid Waste Systems for Localities Law
Pollution Discharge Elimination Law
Hazardous Substances Law
Inland Lake Rehabilitation Act
Mine Reclamation Law
Power Plant Siting Law

National Environmental Energy Workforce Assessment

Phase I

WYOMING

State Summary

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I. AIR

Major air pollution problems are not as prevalent in Wyoming as in some of the other states, and Wyoming air quality is higher than the national standards, for the most part. There are two Air Quality Maintenance Areas (AQMA) in Wyoming as defined by the U.S. EPA Region VIII Administrator. The Wyoming Environmental Quality Act, 1973, authorized the establishment of the Division of Air Quality in the Department of Environmental Quality (DEQ).

Experts within the field of air pollution control and abatement find it difficult to make projections regarding workforce requirements for Wyoming for the near future. The major reason for this reticence lies in the fact that Wyoming is an energy impacted state. With the continuation of coal development and the increase in population and energy related development, a three to five percent growth may be anticipated.

Air pollution control career opportunities will be available at the degreed level in limited numbers. Industrial air pollution control equipment is exceedingly expensive and is not apt to be relegated to less than highly expert responsibility. Considerable engineering experience will generally be demanded by industry. In the future, this sector will present the majority of the air pollution control and abatement career opportunities.

II. NOISE

Wyoming has no noise legislation at the present time. There is no state allocated responsibility for a noise pollution control and abatement program. Wyoming is an agricultural state, and has few of the population-related problems which are common to more urbanized states.

The Department of Environmental Quality has stated that at present there is little need for a noise control program, as problems are not now prevalent enough to necessitate the establishment of one.

At the state level there appears to be no full-time personnel. There are no available figures for the local workforce.

There are several local noise ordinances in the state. Cheyenne, Lander, Powell and Riverton presently have ordinances, as does Casper.

Career opportunities in the state will be limited during the next three to five years. As state and local programs begin to emerge, career opportunities will be more available. These occupations will mostly be representative of degreed engineering categories. Engineering with acoustical expertise will be in demand at the local level and perhaps in energy related industries. New or distinct careers are not expected to emerge at least until the late 1980's.

III. PESTICIDES

The Wyoming Department of Agriculture has been designated as the agency with primary responsibility for all pesticide related activities and programs in the state. The Department administers forty-one laws. The following impact the environmental area of pesticides: the Predator Animal Control Law; Wyoming Weed & Pest Control Act; Wyoming Environmental Pesticide Control Act of 1973; and the State Entomologist Law.

The Wyoming Department of Agriculture is a leader in the area of pesticides within Region VIII. The State Pesticide Plan has been utilized extensively throughout the region as a prototype for other states attempting to establish regulations and guidelines pursuant to FIFRA. Departmental pesticides objectives include the development, implementation, and maintenance of a program that will comprehensively regulate the labeling, distribution, storage, transportation and disposal of pesticides. The dissemination of up-to-date information, and the granting of technical assistance to users regarding correct, all-around usage of pesticides are also Departmental pesticides objectives.

Degreed personnel will be required in administrative positions. The number of certified, non-degreed commercial personnel will experience minimal growth due to increased efficiency.

IV. POTABLE WATER

As in most western agricultural states, water is a most valued resource in Wyoming. The state has stepped into an age of great mineral development which carries with it the critical necessity of responsible water usage and extensive planning for the future. At present, there are 3.8 million acre feet of water unused and allotted to the state's future requirements.

The Wyoming Environmental Quality Act of 1973 legislatively allocated the responsibility for drinking water in the state to the Department of Environmental Quality (DEQ), the Water Division. Other agencies working cooperatively with the DEQ include: the Department of Agriculture, the State Engineer, and the U.S. Geological Survey.

The Water Quality Division along with the other DEQ Divisions, has experienced a substantial growth since the Department's creation in 1973. The potable water area of the Division will have vast increases in program responsibility should the state assume primacy. The number of operators statewide will increase over the next five years.

New jobs will be created in this field as a consequence of advancing technology, and more stringent federal and state legislation. Opportunities will continue to be available at the operator level.

V. RADIATION

The major responsibility for radiological health has been delegated to the Department of Health and Social Services, Division of Health and Medical Services, Radiological Health Services Section. The primary responsibility is to reduce and/or prevent unnecessary radiation exposures to the people of Wyoming.

Proposed legislation, intended to give authority to the Section to adopt rules and regulations for the control of radiation, would also allow negotiation with the U.S. Nuclear Regulatory Commission (NRC) in an effort to become an Agreement State.

The Radiologic Health Services Section is understaffed at present. But, increases in this staff are anticipated to be minimal. In the private sector, increases will be in the medical and dental fields.

With the increase in energy-related activities across the state and increased population, career opportunities will be available to a limited degree. Competition is expected to increase among radiation protection specialists and engineering graduates with radiation and nuclear expertise. Although mining and milling do not necessitate large increases in radiation technicians, highly skilled engineers and health physicists will present areas of career opportunity as a result of these activities.

VI. SOLID WASTE

Solid waste management has not been a critical area of concern to the state in the past, but this program should emerge as an increasingly important element in the overall state plan. As with many other environmental questions, this increased importance will be as a result of energy resource development.

The primary responsibility for solid waste management in Wyoming has been allocated to the Department of Environmental Quality (DEQ). The primary goal is the elimination of improper handling and disposal of solid waste.

There is a possibility that the present statewide workforce could triple or quadruple over the next five years due to energy related activities. This will be especially noticeable in the impending energy related impact on small towns, and the very real possibility of the creation of towns around mining and milling sites where none now exist.

Career opportunities will exist in solid waste management in Wyoming. These may be accentuated if energy development proceeds at the pace forecast by some experts. The upgrading of educational and technical skills will be important. Job opportunities for engineers with hazardous and toxic waste expertise will be available in private industry and government. The acceleration of uranium activities within the state will increase opportunities in the field of solid waste.

VII. WASTE WATER

Several agencies are involved in waste water activities in the State of Wyoming. The lead agency has been identified as the Department of Environmental Quality (DEQ). The Department of Agriculture is currently involved in extensive waste water activities.

The Wyoming Conservation Commission (of the Department of Agriculture) assists the thirty-nine conservation districts within the state in the development and administration of conservation programs for urban and rural areas. The Conservation Commission and the Department of Environmental Quality are developing a contract and a workplan regarding the P.L. 92-500, Section 208, Water Quality Planning Program.

A one to two percent per annum increase is anticipated for the waste water personnel of the DEQ Water Quality Division. Although the turnover rate is relatively low, it is anticipated that the majority of the estimated staff increases will be the result of new hires as the program is strengthened. Statewide, coal development and increases in uranium mining and milling along with increased population-related problems will necessitate additional treatment plant personnel. Career opportunities in the waste water field will increase. These occupational opportunities will include operators and degreed technical and administrative personnel.

VIII. ENERGY

There are innumerable programs, offices and agencies currently involved in energy related activities in Wyoming. The development of energy resources, especially coal and uranium, is closely aligned with problems which impact the environment. Among the agencies involved in energy activities are: the Department of Environmental Quality (DEQ), and the Department of Agriculture.

Increases in the energy pollution control and abatement workforce will occur over the next three to five years. Career opportunities will be available throughout the state. Job categories will be representative of highly skilled, degreed level positions as well as technician level occupations. Specialized engineering and geological skills will be in demand. Expertise relative to Environmental Impact Statements will be sought by the industrial sector, state and local agencies.

Wyoming has established a program which allows for the coordination of state land use related problems. In conjunction with the land use program, the state has the authority to determine the siting of power plants.

The energy related activities ongoing in Wyoming present new challenges to this sparsely populated western state. Coal continues to be exported by rail, at the rate of forty trains per day averaging one hundred cars each.

STATE OF WYOMING - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)
(estimated)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR	214	220	227	234	241	248	3%
NOISE	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PESTICIDES	4,695	4,836	4,981	5,130	5,284	5,443	3%
POTABLE WATER[1]	168	182	210	241	276	316	15%
RADIATION	105	108	111	114	117	121	3%
SOLID WASTE	252	354	454	555	653	756	40%
WASTEWATER[2]	193	215	242	271	305	343	13%
ENERGY[3]	30	38	40	42	42	42	7%
TOTALS	5,657	5,953	6,265	6,587	6,918	7,269	5%

[1] Includes no growth at the state level.

[2] Includes a 2% per annum growth for state level.

[3] Does not include private sector.

EDUCATION

There are 8,100 students, in 180 programs of study offered in seven academic colleges at the University of Wyoming.

The University of Wyoming, College of Agriculture, offers a Bachelor of Science degree with a major in several fields including Entomology and Range Management. The College of Agriculture also conducts research on land reclamation and presents courses relative to strip mining.

Other environmentally-related courses of study are available at the University. A graduate program leading to the degrees of Master of Science and Doctor of Philosophy is available through the Department of Atmospheric Science. The Department of Civil and Architectural Engineering offers a Bachelor's, Master's, and Doctorate.

A University-wide organization established to conduct research related to water resources is the Wyoming Water Resource Research Institute (WRRI). The WRRI has established three outdoor resource observatories which are an integral part of this program. Currently the Institute has undertaken research relative to the disposal of sewage, in cooperation with the State Department of Agriculture.

Since 1945, seven community colleges have been established in Wyoming. Casper College was the first two year institution in the state. Casper College offers an A.S. degree in Environmental Health.

LEGISLATION

The environmental/energy legislation for Wyoming was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Wyoming Environmental Quality Act
Environmental Pesticide Control Act
Protection of Public Water Supply Act
Radioactive Isotopes Law
Solid Waste Law

National Environmental Energy Workforce Assessment

Phase I

DISTRICT of COLUMBIA

Summary

I. AIR

The District of Columbia's Department of Environmental Services has overall authority for the implementation of the State Implementation Plan for the National Capital Air Quality Control Region. The Department's Bureau of Air and Water Quality Control has program responsibilities for the control and abatement of the District's air pollution.

The Bureau's Air Quality Division is staffed with chemists, civil, mechanical, and chemical engineers. Although the Bureau's air program is not projected to increase in staffing by 1982, it is anticipated that careers in the private sector will continue to develop for technicians and other semi-professional personnel, rather than for engineers or other highly educated professionals. These jobs are expected to be created as a result of more advanced control process technology. The private sector will require technicians to maintain this advanced control process technology in proper operating condition. Personnel are also needed who can determine whether or not polluters are continually in compliance with ambient air quality standards.

The Bureau's Air Quality Division may recruit additional personnel but only if EPA promulgates new standards or additional amendments to the Clean Air Act are enacted by Congress. Under these circumstances, it is likely that engineers, chemists, and technicians would be recruited.

II. NOISE

Noise control activities are the responsibility of the Department of Environmental Services' Environmental Health Administration. Prior to the Department's reorganization in 1976, noise control was conducted by Bureau of Occupational and Institutional Hygiene personnel. At present, the Bureau responds to citizen complaints regarding excessive levels of noise pollution using sound level monitoring equipment.

The District of Columbia has zoning and vehicle ordinances which include acoustical criteria and a nuisance regulation. Enforcement authority has been delegated to the District Police Department. The Division assists the police in a technical advisory capacity.

Noise legislation is currently pending before the District government which is designed to set limits on community noise levels with acoustical criteria included in the regulations. If the legislation is implemented by the Bureau, an additional eight positions would be created to satisfy its provisions. One electrical engineer would be needed to repair equipment. An urban planner would be required to conduct studies on traffic noise problems and on other areas. Six technicians would be recruited to perform monitoring tasks. At present, the Bureau is staffed by temporaries and the legislation would require permanent staff to carry out its provisions.

III. PESTICIDES

The Department of Environmental Services is the designated lead agency for implementation of the District's State Plan for the Certification of Applicators. The District government has proposed legislation before it called the Pesticide Operations Act that authorizes the creation of a program to satisfy the provisions of the Federal Fungicide, Insecticide, and Rodenticide Act as amended. However, this new Pesticide Act has been delayed in its passage.

A new Hazardous Chemical Control Division is to be created under the Department's Bureau of Consumer Health Services. The Division is to have authority under the Pesticide Operations Act to regulate the use and application of pesticides. The Department of Economic Services is to have authority to issue, deny, suspend, or revoke licenses of pesticide applicators, wholesalers, distributors, and retailers. The Cooperative Extension Service of the District of Columbia is to participate in training activities and administering examinations.

Four additional consumer safety officers are expected to be recruited in the next few years to provide the Hazardous Chemical Control Division with an inspection capability. These persons are expected to be experienced in the use and application of pesticides. Commercial applicators, according to the State Plan, are to have their licenses renewed annually, whereas private applicators are to renew theirs tri-annually to retain active certified status.

IV. POTABLE WATER

The Washington Aqueduct, operated by the Army Corps of Engineers, is the District of Columbia's principal water supply. Water supply program activities are the responsibility of the Department of Environmental Services' Environmental Health Administration and Water Resources Administration. The Bureau of Air and Water Quality Control and the Environmental Health Administration enforces District regulations, and the Water Resources Management Administration maintains distribution systems and water meters. The Department has expressed an intent to EPA to assume primacy for the federal Safe Drinking Water Act (SDWA).

The Bureau is staffed with civil and sanitary engineers. Environmental Health Technicians collect water samples for laboratory analysis. Once primacy is assumed for SDWA, additional engineers, chemists, bacteriologists, and technicians will need to be recruited to enforce the Act.

The Water Resources Management Administration is professionally staffed with civil and mechanical engineers. Water Services Workers, meter installers, consumer services representatives, and various other semi-professional positions make up the bulk of the Administration staff. It is not anticipated that the Water Resources Management Administration offices will grow due to budget constraints.

V. RADIATION

Radiation control activities are located within the Department of Environmental Services' Environmental Health Administration. Program activities have recently been transferred from the Bureau of Institutional Hygiene and Radiological Health to a new Bureau of Occupational and Institutional Hygiene as a result of reorganization.

The Radiological Health Section is responsible for regulating sources of both non-ionizing and ionizing radiation. The District government recently enacted enabling legislation to regulate users of radioactive materials. This legislation paves the way for the District to enter into a Federal-State agreement with the Nuclear Regulatory Commission to regulate users of radioactive materials. This section is principally staffed with health physicists and chemists and, at the present time, no additional staff are anticipated to be recruited by 1982. If funding does eventually become available to the Radiological Health Section as a result of the acquisition of new program responsibilities, two public health physicists may be recruited to inspect users of radioactive materials in accordance with their Agreement State authority.

VI. SOLID WASTE

The District of Columbia manages its solid waste primarily through the use of an incinerator and a sanitary landfill. The Department of Environmental Services' Solid Waste Management Adminstration has program responsibilities for solid waste management activities.

A Bureau of Solid Waste Collection, a Bureau of Solid Waste Disposal, and an administrative unit make up the Solid Waste Management administration. The Bureau's collection force consists of 916 persons including sanitation workers, motor vehicle operators, and support personnel. The Bureau of Solid Waste Disposal has 232 persons on its staff who are mainly landfill/ incinerator operators, engineers, motor vehicle operators, mechanics, and sanitation workers. Unless positions are recruited to operate resource recovery operations, it is not anticipated that additional positions will be made available to the Solid Waste Management Administration. However, it is also possible that additional chemical engineers and other professionals may be hired for hazardous waste management activities, but no information is available concerning this area at this time.

It is possible that the District's incinerator may be converted to a steam producing plant. Residue produced as a result of its operations could be used as an aggregate in asphalt to pave the District's streets. Specific projections of increased workforce needs concerning resource recovery operations are not available at present as many operations are currently still in their planning stages.

VII. WASTE WATER

The District of Columbia's Department of Environmental Services has overall administrative responsibility for implementing wastewater pllution control as mandated by the Federal Water Pollution Control Act (FWPCA). Under the Environmental Health Administration, the Bureau of Air and Water Quality Control has program responsibilities over its Division of Water Hygiene Control. The U.S. Environmental Protection Agency (EPA) currently has the authority to issue permits under the National Pollutant Discharge Elimination System (NPDES). The Division principally enforces District water quality regulations and the Bureau's Division of Engineering Services provides review of plans and specifications of construction grant activities involved in the upgrading of the Blue Plains Wastewater Treatment Plant, which is the District's sole treatment facility.

The Blue Plains facility, which is currently being upgraded, is the responsibility of the Department's Water Resources Management Administration. It is expected that by 1978, the Blue Plains Plant will have to recruit an additional 200 personnel. The Administration's Bureau of Water and Sewage Services maintains the District's distribution systems, treatment plants, and facility maintenance.

The Bureau of Air and Water Quality Control is primarily staffed by sanitary and civil engineers and environmental health technicians. Only the Blue Plains Waste Water Treatment Plant expects to recruit additional personnel.

VIII. ENERGY

The District of Columbia does not have a state energy agency at the present time.

DISTRICT OF COLUMBIA - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR[1]	19	19	19	19	19	19	N/A
NOISE[2]	4	8	12	12	12	12	30%
PESTICIDES[3]	13	14	15	16	17	17	6%
POTABLE WATER[4]	186	186	186	186	186	186	N/A
RADIATION[5]	5	5	5	5	5	5	N/A
SOLID WASTE[6]	1,151	1,151	1,151	1,151	1,151	1,151	N/A
WASTEWATER[7]	311	311	311	311	311	311	N/A
ENERGY[8]	--	--	--	--	--	--	N/A
TOTALS[9]	1,689	1,694	1,699	1,700	1,701	1,701	N/A

[1] The above represents only personnel of the Air Quality Division.

[2] The above does not include law enforcement agencies or the private sector.

[3] The above includes state program personnel, but does not include an estimated 130 federal, 302 commercial, and 20 private applicators requiring certification.

[4] The above includes only personnel of the Bureau of Air and Water Quality Control and the Water Resources Management Administration.

[5] The above includes personnel of the Radiological Health Section.

[6] The above does not include the private sector.

[7] The above includes personnel of the Bureau of Air and Water Quality Control and the Water Resources Management Administration.

[8] The District of Columbia does not have an energy agency at the present time.

[9] Insufficient data to make realistic projections.

EDUCATION

George Washington University offers numerous career options in the environmental disciplines. The College of Law offers both L.L.M. and J.S.D. degrees in Environmental Law. The College of Engineering awards both undergraduate and graduate degrees in Environmental Civil Engineering. Other advanced degrees available through the College of Engineering include: Environmental Modeling; Acoustics; and Energy, Resources, and Environment.

Through its Continuing Education Program, George Washington University offers a variety of environmental and energy related programs. During the last year, the university offered short courses and seminars in energy conservation, environmental law, solar heating and cooling, preparing environmental impact statements, and numerous other related topics.

Several of the degree programs available at George Washington are reviewed in the State Report. The Report contains detailed information on student enrollment and course offerings.

Other than the degree programs offered through George Washington Universities, career options in environmental disciplines are limited in colleges and universities located within the District of Columbia. Nevertheless, individual courses related to general environmental concerns are available at other colleges and universities in Washington, D.C.

LEGISLATION

The environmental/energy legislation for District of Columbia was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Air Pollution Control Act
Solid Waste Law
Federal Water Pollution Control Act

National Environmental Energy Workforce Assessment

Phase I

PUERTO RICO

Territorial Summary

I. AIR

Protection of Puerto Rico's air quality is a function of the Commonwealth's Environmental Quality Board (EQB). Pollution control and abatement activities are located in the Air Quality Bureau, which is under the direction of the Associate Director for Air and Water. There are no local or municipal agencies with any responsibilities for air pollution control.

The Air Quality Bureau is composed of a Permit and Engineering Division and a Complaints and Surveillance Division. In addition, air pollution control personnel are also located in the Office of the Associate Director for Air and Water and in the Laboratory and Sampling and Data Management Bureaus, which support the water quality program as well as the air program.

The air pollution program has a current staffing level of 43 persons which includes 28 full-time persons on the program and 15 persons who devote approximately half time to air pollution functions. This equates to 36 person-years spent on the program. The program is staffed with engineers, chemists, natural resources specialists, meteorologists and natural resources technicians.

Activities in the air pollution program are expected to increase as a result of several specific functions to be carried out in the next few years. These functions include: air quality maintenance planning, compliance and permits, NSPS and NESHAPS programs, and sampling and laboratory activities. It is likely that career potential in Puerto Rico's air program will be for engineers, technicians, and natural resource specialists.

II. NOISE

Puerto Rico's regulation of noise pollution is covered under the Commonwealth's Environmental Policy Law and administered by the Environmental Quality Board (EQB). In addition to environmental noise, the Commonwealth also has an "unnecessary noise" law which is under the jurisdiction of the Department of Public Works. The only municipality in the Commonwealth which has a noise ordinance is San Juan.

There are currently three persons working in the Noise Bureau within EQB. Two of these persons are natural resources specialists and the third is a noise inspector, a position which does not require college training. Additionally, the Bureau is authorized one engineer, as program director; however, this position is currently vacant.

Program officials indicate that the present workforce level is not adequate to administer the program effectively, and that a total of 18 persons would be necessary for proper enforcement. It is estimated that the program's vacant engineering position will be filled in 1977, bringing the program to authorized strength. It is also projected that two additional people will be hired in 1979, an engineer and a natural resources specialist. Officials were unable to make projections beyond 1979 but indicated that turnover is expected to be negligible. Although there will be few positions available, those that do exist will require professional training in engineering or the physical sciences, with some background in acoustics being desirable.

III. PESTICIDES

In the Commonwealth of Puerto Rico, the Department of Agriculture has been designated as the lead agency for the administration of the pesticide applicator certification program. The Commonwealth's Certification Plan is administered by the Department's Analysis and Registration of Agricultural Materials Laboratory.

The Laboratory is staffed with twelve persons including chemists, agronomists (inspectors), a laboratory assistant and secretaries. One person has a position of Liaison Officer-Pesticides, who devotes full-time to the Certification Program. The applicator training is administered by the Commonwealth Cooperative Extension Service which has an Extension Training Coordinator and seven coordinators. They receive additional assistance from about 100 county agents.

It is estimated that approximately 1,000 commercial applicators and 25,000 private applicators will need to be certified. Several additional positions have been requested by the Department for the Certification Program during 1977. The laboratory has one vacant inspector position which is expected to be filled, and one additional inspector has been requested for the program. One executive administrative officer and a laboratory assistant may be recruited by the end of 1977. It is anticipated that with the additional requested personnel on board, the laboratory's pesticide staffing will increase to a total of fifteen. Further projections beyond 1977 were unobtainable, but it is thought by Department professionals that the total staff of sixteen would be adequate for the duration of the five year period 1977-81.

IV. POTABLE WATER

Puerto Rico's potable water program is administered by the Commonwealth's Department of Health. There are no laws or regulations specifically relating to water supply; consequently, the Commonwealth cannot obtain primacy under the Safe Drinking Water Act (SDWA). The Puerto Rico Aqueduct and Sewer Authority (PRASA) has responsibility for the construction, operation, and maintenance of the public water treatment facilities. These facilities are all owned and operated by PRASA.

The Health Department currently has seven persons working full-time in the water supply program: one engineer, four environmental health officers, and two inspectors. In addition, there are 50 inspectors in the Health Department who devote approximately 30 percent of their time to the potable water program.

Substantial growth in the water supply program is anticipated in the next two years as the Health Department expands its activities to bring the program into compliance with federal standards and assumes primacy under SDWA. An additional engineer is expected to be utilized for the Department's plan review program, and a chemist, bacteriologist, and secretary will be necessary to increase laboratory capabilities for the lab certification program. Several additional Environmental Health Officers will be hired, probably in 1978, to handle program activities in each of Puerto Rico's seven regions.

V. RADIATION

All of Puerto Rico's radiation control activities are located in the Radiological Health Program of the Commonwealth's Department of Health. The Program has four basic areas of responsibilities which include X-ray survey and control, radioactive materials, non-ionizing radiation, and planning and administration. The X-ray survey and control function is the largest and is concerned with the registration and inspection of X-ray machines to ensure compliance with regulations.

There are currently ten full-time and two part-time persons in the Radiological Health Program. Other than the radiological health director, the Program employs five radiological health specialists, one radiological health technician and three supportive personnel. The radiological health specialist position requires a bachelor's or graduate degree in engineering, biological, or physical sciences.

No projections regarding the growth/decline of personnel or turnover in the Radiological Health Program were available. The program has experienced funding difficulties over the past few years and now receives about fifty percent of its support from the federal government. Future jobs will probably require professionals with degrees in engineering or the natural sciences. There may also be some opportunity for technicians with a high school education.

VI. SOLID WASTE

Implementation of the solid waste program in Puerto Rico is the responsibility of the Commonwealth's Environmental Quality Board (EQB). The Board has a Bureau of Solid Waste which is under the direction of the Associate Director for Noise and Solid Waste.

The Bureau of Solid Waste has a current staffing level of 15 persons. The Bureau is composed of engineers, biologists, sanitarians and an environmental technician. The program's two engineers have degrees in either mechanical or civil engineering.

The primary method of solid waste disposal in Puerto Rico is the landfill. There are 38 licensed landfills in the Commonwealth, and these are municipally owned and operated. Officials of the Bureau estimate that there are approximately 150 persons working in landfill operations.

Program officials within the Bureau of Solid Waste anticipate that the workforce will double by 1978. They indicate that program expansion is consistent with EPA's solid waste program and with the recently enacted Resource Conservation and Recovery Act. Career opportunities will continue to be greatest for persons with professional training in engineering and the sciences. The largest increase can be expected to occur in 1978 and several more people will be added in 1979. At this point the workforce will stabilize with little, if any, future growth foreseen during the remainder of the next five year period. Officials also indicate that they expect position requirements to remain substantially the same.

VII. WASTEWATER

Primary responsibility for the wastewater program in Puerto Rico rests with the Water Quality Bureau and the Water Resources Management Bureau under the direction of the Associate Director for Air and Water of the Environmental Quality Board (EQB). Created in 1970, the EQB is responsible for the implementation of the Federal Water Pollution Control Act Amendments (FWPCA) as well as Puerto Rico's water quality regulations. Although EQB is responsible for water quality management activities, another agency, the Puerto Rico Aqueduct and Sewer Authority (PRASA), has responsibility for the construction, operation, and maintenance of all public wastewater facilities.

The staffing of the water quality program in the EQB consists of a total of 87 people. Seventy-one work on the water program while 16 divide their time between the water and the air programs. An overall growth rate of about five percent per year is viewed as realistic, with the greatest demand for engineers. Workforce growth in the EQB is estimated to be small although increased activity in each of the program functions is anticipated.

The Puerto Rico Aqueduct and Sewer Authority (PRASA) is divided into four operational areas: Operation, Engineering, Administration, and Commercial Relations. There are 100 public sewage treatment plants in Puerto Rico and five or six industries have their own treatment facilities. Field Research suggests that there are more than 4,000 people currently working in PRASA.

VIII. ENERGY

Energy matters in Puerto Rico are the concerns of three distinct Commonwealth agencies: the Department of Consumer Affairs, the Office of Petroleum Fuels Affairs, and the Puerto Rico Water Resources Authority (PRWRA), which is the island's electric power utility. The Department of Consumer Affairs has designated an Energy Group to promote energy conservation planning and has submitted a proposed energy conservation plan for the Commonwealth to FEA.

Puerto Rico now has a developed petroluem refining industry which provides most of the Commonwealth's energy needs. Although the Commonwealth is still largely dependent on imported fuel, it now exports considerable amounts of energy.

Following the energy crisis in 1973, Puerto Rico developed a program to conserve energy within government institutions and to promote energy conservation by the general public. The proposed energy conservation plan is perceived as a first step toward attainment of a comprehensive strategy. Solar energy is particularly attractive because of the climate in the Commonwealth. The government plans a massive use of solar devices in new housing construction. The Commonwealth has also developed an educational program which is designed to influence the public attitude and to induce people to adopt energy conservation practices. Demonstration projects will also be developed under this program.

COMMONWEALTH OF PUERTO RICO - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR[1]	28	36	38	40	42	44	10%
NOISE[2]	3	4	4	6	6	6	17%
PESTICIDES[3]	122	124	124	124	124	124	.4%
POTABLE WATER[4]	7	11	18	18	18	18	24%
RADIATION[5]	10						N/A
SOLID WASTE[6]	15	18	29	36	36	36	21%
WASTEWATER[7]	71	74	78	82	86	91	5%
ENERGY[8]							N/A
TOTALS	256	267	291	306	312	319	5%

[1] The above represents full-time personnel of the Environmental Quality Board (EQB).

[2] The above includes EQB personnel but does not include law enforcement personnel.

[3] The above includes public sector personnel but does not include an estimated 968 commercial and 25,000 private applicators that will require certification.

[4] The above includes only personnel of the Health Department and does not include water supply and water treatment plant operators for which figures were not available.

[5] The above includes only full-time personnel of the Health Department. Projections of workforce needs were not available.

[6] The above includes only EQB personnel and does not include municipal landfill operators.

[7] The above includes only full-time personnel of EQB and does not include wastewater treatment plant operators for which figures were not available.

[8] No figures were available at the time of the preparation of this report.

EDUCATION

A Bachelor's level program in Environmental Management is offered through the University of Puerto Rico, Rio Piedras Campus. The program emphasizes a curriculum in basic sciences. The Mayaguez Campus offers a Bachelor's program in Engineering and Agricultural Sciences. The University of Puerto Rico, a commonwealth-funded, public institution, has four campuses: Rio Piedras, Mayaguez, Cayey, and Humacao. The University of Puerto Rico had a total enrollment of 51,061 during academic year 1976-77.

A system of five regional colleges, similar to the community college systems of many states, has commonwealth sponsorship. The five regional campuses are located in Aguadilla, Arecibo, Bayamon, Carolina, and Ponce. No information was obtained regarding environmental programs at the regional colleges.

There are several private post-secondary educational institutions located in Puerto Rico. The Inter American University of Puerto Rico has an extensive campus system. Courses are available through nine campuses: Hato Rey, Arecibo, Barraquitas, Bayamon, San German, Aguadilla, Fajardo, Guayama, and Ponce. The University offers a less than four-year program. Information is presently lacking as to whether environmentally-related programs are offered through the University.

LEGISLATION

The environmental/energy legislation for Puerto Rico was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Organic Act of the Department of Natural Resources
Law on the Control of Air Pollution
Economic Poison Act

National Environmental Energy Workforce Assessment

Phase I

VIRGIN ISLANDS

Territorial Summary

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I. AIR

The air quality in the Virgin Islands of the United States currently meets all standards of ambient air quality established under the Clean Air Act. The territory's air pollution control program comes under the auspices of the Department of Conservation and Cultural Affairs and is staffed by 18 individuals who represent the state/local effort on the islands. Prospects for career openings in this program or in the industrial sector have been classified as slim due to the lack of resources to finance new positions and the absence of either a significant labor force or industrial growth.

Training has been quite successful; however, the program director believes that training is never complete and therefore frequently requests both general and island-specific air pollution training workshops and/or courses for both the technical and professional staff.

II. NOISE

Currently, the Virgin Islands Government possesses no noise control statutes aimed at reducing industrial and residential noise through specific acoustical requirements. During Fiscal Year 1976, a Noise Control Act was developed and subsequent public hearings were conducted on the Islands of St. Thomas, St. Croix, and St. John. However, the Act contained several areas subject to disagreement and concern which prevented it from becoming enacted into public law. Efforts to secure an enforceable noise control law for the territory will continue despite current setbacks.

At present, the Division of Natural Resources Management of the Department of Conservation and Cultural Affairs has the responsibility to coordinate all noise matters of the islands. Presently, less than one person-year is devoted toward this end by an engineer from the Division's Air Pollution Control Program.

If future efforts are successful in establishing a noise abatement law, then it is anticipated that at least one professional from the Division will be warranted with full-time responsibilities to coordinate all noise-related activities. Additionally, it is expected that field inspectors in the air and pesticide programs will be trained to serve as certified field personnel for noise monitoring, inspection, and enforcement, in addition to their current duties and responsibilities.

III. PESTICIDES

The Pesticide Control Program is located within the Division of Natural Resources Management of the Virgin Islands Department of Conservation and Cultural Affairs. The Pesticide Control Program staff consists of a chief, a chemist, two inspectors, and a secretary. Support is received for the pesticide applicator certification program from the Virgin Islands Cooperative Extension Service, College of the Virgin Islands, which is the principal delivery mechanism for certification training. It is estimated by program administrators that there are about 80 major users of pesticides in the Virgin Islands.

Additions to the existing staffing structure of the Pesticide Control Program are not anticipated over the next five year period. Spokesmen for the program estimated that only 180 private applicators and 120 commercial applicators will be certified by October, 1977. It is also expected that approximately 15 in-house resort hotel applicators will require commercial certification. During interim periods of the four-year renewal/recertification period, it is expected that a total of 20 individuals (commercial and private) will require recertification on a per annum basis through 1981.

V. RADIATION

The U.S. Virgin Islands have no radiation ordinances. Regulation and inspection of existing dental, medical, veterinary, and industrial X-ray units as well as all radioisotope users are conducted on a purely voluntary basis. Further, there are no nuclear power stations in the Territory.

The Director of the Division of Natural Resources Management coordinates all radiation efforts, and it is anticipated that by 1981 an additional half-time professional will be required to assist with the program.

IV. POTABLE WATER

The primary source of potable water in the U.S. Virgin Islands is provided by six salt water desalination plants operated by the Water and Power Authority (WAPA), and treated and distributed by the Department of Public Works. Residences and commercial establishments maintain rainwater collection systems which, in a majority of instances, provide a substantial amount of the water requirements. The Division of Natural Resources Management of the Department of Conservation and Cultural Affairs has monitoring and certain regulatory authority over potable water samplings and analyses.

Current workforce statistics show that the Department of Public Works employs approximately 70 individuals charged with delivery of potable water to the citizenry of the islands. The Division of Natural Resources Management of the Department of Conservation and Cultural Affairs employs one engineer (part-time), one environmental technician, and one marine biologist in its water monitoring section. Four persons are employed in the Division's laboratory section.

Training for water supply operators has been classified by sources as deficient due to lack of funding. There is no mandatory certification for operators/distributors on the islands. No new career development is possible unless more monies become available.

VI. SOLID WASTE

Solid waste disposal is regulated and managed by the Division of Utilities and Sanitation of the Virgin Islands Department of Public Works (VIDPW). The Solid Waste Management Porgram is administered by a sanitation supervisor for solid waste disposal facilities and a sanitation supervisor for solid waste collections.

The solid waste collection workforce includes supervisors, heavy equipment operators, sanitation workers, truck drivers and weighmasters. These personnel are located on the islands of St. Thomas, St. John, and St. Croix. Solid waste disposal facilities are owned, operated, and maintained by the Department of Public Works. The total collection workforce is composed of 196 persons; the disposal facilities workforce is composed of 37 persons.

The Department of Public Works has recently commissioned a $20,000 study to assess the current situation in the territory's solid waste management system, and to develop overall plans and strategies to alleviate any problems that may exist. Due to the ongoing aspects of the solid waste planning study, workforce projections are not available at this time. Once this assessment is completed, it is believed that a proper management development strategy will be developed to keep workforce dimensions consistent with demands.

VII. WASTEWATER

Responsibility for administering the water pollution control program in the Virgin Islands belongs to the Division of Natural Resources Management. It currently employs 12 individuals and projects a staffing level of 15 by 1981. These additional employees will most likely be engineers. The Department of Public Works has responsibility for the proper operation and maintenance of all public wastewater disposal systems in the territory. This agency employs approximately 38 individuals; however, as complete information as to plans for new plants is unavailable, staff growth projections cannot be made.

There are no certification or training requirements to operate or maintain a wastewater treatment plant in the territory. Nevertheless, with the mandatory introduction of secondary treatment, it is expected that the level of training and education characteristics of the present workforce will, out of necessity, be substantially upgraded.

VIII. ENERGY

The Virgin Islands Energy Program (VIEP), located in the executive offices of the Governor, represents the territory's coordinative group for energy resources planning and coordination. The program is exploring alternate energy systems, effective energy utilization, and research and development necessary for conservation and use of renewable resources unique to this area. These efforts are funded under a grant from the Federal Energy Administration.

Most energy consumption on the islands is charged to the Hess Oil Virgin Islands Corporation and the Martin-Marietta Alumina Corporation. Together, they account for over 90 percent of imports and consumption; the Water and Power Authority accounts for approximately 5 percent. This situation exhibits the almost total reliance on industry for a successful effort to reduce the 1981 projected energy consumption by 5 percent.

THE VIRGIN ISLANDS OF THE UNITED STATES - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR[1]	33	33	33	33	33	33	0%
NOISE[2]	1	1	1	1	1	1	n/a
PESTICIDES[3]	323	343	363	383	403	423	6%
POTABLE WATER[4]	71	71	71	71	71	74	n/a
RADIATION[5]	1	1	1	1	1	2	n/a
SOLID WASTE[6]	232	--	--	--	--	--	n/a
WASTEWATER[7]	50	--	--	--	--	--	n/a
ENERGY[8]	--	--	--	--	--	--	n/a
TOTALS	711	--	--	--	--	--	n/a

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[1] Estimate of workforce level in both public and private sectors. Future growth was projected by state and federal sources to be unlikely.

[2] Total includes one engineer from Air Pollution Control Program. Future growth is questionable unless a noise ordinance is established and funded.

[3] Includes 5 DNRM personnel and 3 extension service personnel, along with 315 pesticide applicators for which a 20 person/year growth rate is estimated.

[4] Private sector figures are unavailable.

[5] Private sector figures are unavailable.

[6] Growth estimates are not available due to ongoing aspects of a planning study to determine future requirement.

[7] Accurate workforce projections are not approachable due to a variety of variables.

[8] Workforce information is unavailable.

EDUCATION

There is only one college in the Virgin Islands: the College of the Virgin Islands in St. Thomas. The college, which was established in 1962, is operated on a semester basis and confers Bachelor's and Masters degrees. The 1975-76 enrollment was 1,918.

At the writing of this report, no response from the college had been received concerning the availability of an environmental or environmentally-related curriculum.

LEGISLATION

The environmental/energy legislation for Virgin Islands was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Environmental Protection Law
Air Pollution Control Law
Pesticide Control Act
Oil Spill Prevention and Pollution Control Act
Water Pollution Control Law